Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXII July 29, 1931 No. 9

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Published bi-weekly on Wednesday for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other nonmetallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

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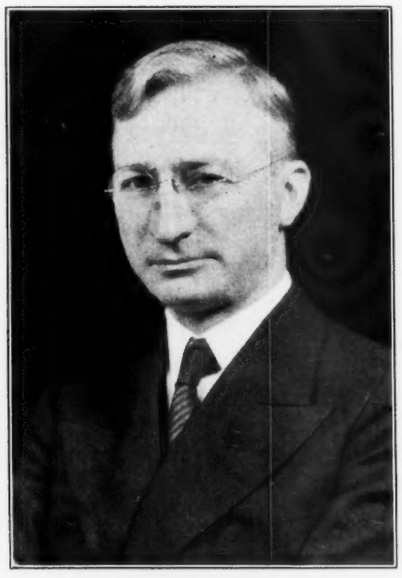
Vol. XXII CHICAGO, JULY 29, 1931 No. 9

E. J. Mehren Elected to Head Cement Assn.

ASSUMES NEW DUTIES SEPT. 1

By electing a president from outside the industry who will devote his entire time to the position, the Portland Cement Assn., so the chairman of its Board, Frank H. Smith, announced July 20, has broken two precedents of long standing. Heretofore the leader of the association has been a president of one of the Portland-cement manufacturing companies. During his term of office he has not only guided the



Edward J. Mehren.

work of the association but has also continued to operate his own company. The duties of association president are so heavy, however, that the industry felt it unfair to continue to impose this burden upon the president of any one of its member companies.

Consequently, the board of directors has elected as president, Edward J. Mehren, vice-president of the McGraw-Hill Publishing Co. Mr. Mehren has been prominent in engineering and business circles through his participation in the work of engineering societies and business organizations.

He was editor for ten years of *Engineering Record* and *Engineering News-Record*. Later he became vice-president and editorial director of the McGraw-Hill Publishing Co., and of late has been in charge of the company's activities in the Middle West, with headquarters at Chicago. He has been at various times a member of the executive committee of the New York Building Congress and father of its well-known craftsmanship awards system; director of the American Road Builders Assn., member of the committee on highways and motor transport of the U. S. Chamber of Commerce; chairman of the Marketing Problems Committee, Illinois Manufacturers Assn. He is a member of the American Society of Civil Engineers, of the Western Society of Engineers, the University Club, New York; the Union League Club, Chicago.

Mr. Mehren assumes his new office September 1. Assisting him in the conduct of the affairs of the association will be George S. Bartlett, recently appointed assistant to Frank H. Smith, chairman of the board; Wm. M. Kinney, general manager, and George E. Warren, assistant general manager.

Asks State Accept Stone Ordered for Cement Mill

Representatives of the Michigan Limestone & Chemical Co. of Rogers City, Mich., have asked the Michigan state administrative board to take possession of about 15,000 tons of crushed stone which was ordered for the state-owned Chelsea cement plant in 1929. The plant recently suspended operations because it had been producing at a loss. The order for the stone was cancelled and the stone now lies on the company's dock at Detroit.

The delegation, headed by Sen. Calvin A. Campbell, told the board that the company's lease on the dock expires next September and that the stone and equipment must be moved. Sen. Campbell said that the state had incurred a moral obligation to take the material.

Wisconsin Gravel Plant Moves to New Location

The Champion Gravel Co. which has operated a sand-and-gravel plant at Pound, Wis. for the past seven years has closed and all machinery and rigging is being moved to a location near Iron Mountain, Mich. Julius Dams is superintendent.

Build R. R. to Haul Boulder Dam Gravel

TO REQUIRE 5,000,000 CU. YD.

A railroad 16 miles long is now going forward at the Boulder Dam site which will, when finished, transport an immense yardage of gravel from the Arizona side of the river to a point on the Nevada side where concrete will be mixed for construction of the huge project.

Some 5,000,000 cu. yd. of gravel are to be used in the dam, and the new railway for its transportation is being built under contract by the John Phillips Co., of San Francisco.

This is regarded as the largest major development of several months in the dam project. The railroad will wind along the Nevada bank of the Colorado River from the dam site to a point on the Nevada side directly opposite the gravel pit, which is on the bank of the river on the Arizona side eight miles as the crow flies from the dam site.

Frank T. Crowe, superintendent of Six Companies, Inc., builders of the dam, revealed details of the plans for transporting the gravel across the river and then down-stream by train. A belt conveyor on a suspension bridge will be used to carry the material, after it has been washed and graded, from the pits and plant on the Arizona side across to the Nevada side, where it will be dumped into cars for the trip along the course of the river to where it will be used to create the mightiest dam ever constructed.

The John Phillips Co., has a bare three months in which to complete this railroad. Work was started June 1 and must be completed by Sept. 1.

The gravel deposit which will be excavated is about half a mile long. The pits will cover about 100 acres, the highest portion of which is not more than 55 ft. above the level of the river. Test holes as deep as 69 ft. maximum were dug by O. G. Patch and his corps of workers in making appraisal of this pit, which he states is the best he ever saw anywhere.

About a year on the part of five men was spent in comparing all possible gravel sources within 50 miles and some as far as 100 miles from the dam site, and the one chosen as the best chanced to be one of the nearest.

Dust Found Harmful in Plants, Quarries

HEALTH BUREAU ENDS SURVEY

Dust around quarries and stone cutting plants, containing large percentages of free silica was the most harmful to the health of the workers in the plants, it was found by the United States Health Service following a careful survey of dust in industry. The Health Service also found a high dust content in the air in cement plants, though this dust was not as harmful as the free silica dust.

A large proportion of workers in granite-cutting plants and other plants where free silica dust was present developed pulmonary tuberculosis, it was said. Most of the workers in these plants were found to be exposed to an average of about 60,000,000 particles of dust per cubic foot of air.

It was found the dust in granite-cutting plants contained about 70 per cent. silica, of which about 35 per cent. was in the form of quartz or free silica.

The Health Service reports that, under such conditions, there was an almost universal occurrence of silicosis and a large proportion of the workers developed pulmonary tuberculosis. This disease, as a rule, did not make its appearance until after some 20 years of exposure, but when it did develop, a fatal result within less than two years was almost certain.

It formerly was thought that the harmful effect of silica dust lay in the sharpness of particles, the Health Service declares, but now it is believed that some chemical effect is present, associated with the slow dissolving of the free particles.

The Health Service found it would be unnecessary to eliminate all the dust to do away with the hazard. A safe limit, it was found, would be somewhere between 9,000,000 and 20,000,000 particles of dust per cubic foot of air.

The Health Service investigated a cement plant which showed a large amount of dust. This plant was said not to be typical, but was chosen because a great deal of calcium dust was present. Although no permanently serious effects appeared in the investigation, the workers were subject to a higher frequency of upper minor respiratory diseases and some other conditions which the Health Service did not name.

"The mitigation of the dust hazard in industry is primarily a ventilation problem," the Health Service said. "In many industries steps have been taken to prevent the escape of dust into the room by surrounding the machine with a suction hood or other device that removes the dust as it forms. The chief necessity is to remove the dust at its source.

"The important points are the seriousness of the dust hazard, the large number of workers exposed, the varying effect of different dusts, the fact that a certain amount of dust has to be present before a hazard exists, and the necessity for removal of the dust at its source."

Petoskey Celebrates on Fourth; Unveils Trophy

July Fourth, 1931, has gone down in history of the Petoskey Portland Cement Co. as another great day. The occasion was marked by the dedication of the Portland Cement Assn. safety trophy at the cement plant and by a great noon and afternoon celebration at the Emmet County Fair Grounds at Petoskey, Mich., where 2,500 persons were guests of the cement company at a barbecue and sports program.

Shortly before noon the monument was unveiled by Betty John, small daughter of Mr. and Mrs. George John and granddaughter of J. B. John, president of the Petoskey Company. Catheryn Switzer, daughter of Mr. and Mrs. E. C. Switzer, assisted at the unveiling.

Homer Sly, vice-president, was chairman of the dedication ceremonies. A. J. R. Curtis, assistant to the general manager of the Portland Cement Assn., who came from Chicago for the ceremonies, presented the trophy to the Petoskey company. E. C. Switzer, superintendent, accepted it on behalf of the company and employees. Mayor Norman Risk of Petoskey, extended greetings and congratulations as did also J. B. John, president, and John L. A. Galster, treasurer and general manager.

Committees in charge of the day's events were: Dedication—E. C. Switzer, chairman; George W. John, Homer Sly and E. O. Nyman; Barbecue—C. L. Phillips, chairman; Don Wheat, Merritt Lesher and L. A. Platt; Sports—Harold Tillotson, chairman; Lyle E. Ernst, Fred Zipp and Marino Sik.

Gets Permit to Produce Granite in U. S. Forest

The Arrowhead Granite Co., which is now operating a quarry near Crook, Minn., has been granted a permit for the quarrying of granite in the Superior National Forest on a site located seventeen miles from Ely, Minn., on the Ely-Finland road.

The permit allows development work within 200 ft. of the roadway, covers 600 acres, and expires in five years.

Tariff Commission Will Probe Feldspar Prices

The U. S. Tariff Commission has instituted an investigation for the purpose of determining the differences in costs of production of crude and ground feldspar, between the United States and foreign countries.

The request for the investigation comes from the Consolidated Feldspar Corp., East Liverpool, O., and asks a decrease in duty.

Arizona Lime Plant Serves Copper Mines

KILNS CUT IN CLIFF OF ROCK

The Copper Cities' lime plant and quarry at Radium, Ariz., between Globe and Miami, is now in operation and serves as an important adjunct to the copper mines in that area. It is owned and operated by a group of local men, and the greater part of the lime it produces is used at the Miami and Inspiration concentrators. There are four kilns at the plant, and the output of each kiln is 10 short tons per day. Under present conditions only one kiln is being operated. The kilns consist of raises, driven from a tunnel level to the floor of the quarry 50 ft. above. They are about 4 ft. in diameter at top and bottom and are belled out to a diameter of 10 ft. at the middle. Firebrick is used for lining.

To break the limestone from the ledge, vertical holes are drilled with an Ingersoll Rand BCRW 430 plugger machine and are blasted with 30-per cent. dynamite. Horses are used to haul the dump carts of limestone from the face to the tops of the kilns. Anthracite is used to burn the lime and is dumped in at the top of the kiln with the limestone in the proportion of one part coal to three parts limestone. The latter is crushed into lumps smaller than 12-in. Calcining requires 36 hours. The kiln is kept full all the time, the limestone and coal being added from above as fast as the burned lime is drawn off from the bottom of the kiln. At the bottom of each kiln is a concrete chute through which the lime is drawn into small mine cars, in which it is trammed by hand on the tunnel level to bins which discharge into trucks for transportation to the concentrators.

Other products of the quarry are rock for concrete aggregate and track ballast. These products are made from limestone not pure enough for making lime. They are crushed in a small jaw crusher and sized in a revolving screen. A 40-hp. Fairbanks-Morse gas engine furnishes power for the screen, crusher, and an Ingersoll Rand compressor. The payroll carries from 15 to 30 men, depending on the demand for the products.

Rainbow Granite Co. to Establish Two Quarries

The Rainbow Granite Co., recently established near Mellen, Wis., will open two quarries and plants on its properties in the Mellen region within a short time according to G. E. Stam, president of the concern. Business conditions at present warrant the opening of the second quarry Mr. Stam declared recently.

At present the installation of machinery is going forward as rapidly as possible and quantity production of stone will begin in a short time.

Howes Cave Observes Safety-Trophy Award

ALL-DAY CELEBRATION ENJOYED

The management and employees of the Howes Cave, N. Y., plant of the North American Cement Corp. saw the reward of their safety efforts on June 11, when, in their presence and of hundreds of their friends and visitors from other cement plants, the Portland Cement Assn. safety trophy, presented to the Howes Cave plant for having completed the year of 1930 without a lost-time accident, was unveiled.

The entire day was given over to the celebration of the event. In the forenoon a ball game, played by teams from Central Bridge and Howes Cave, was won by Howes Cave.

From a decorated speakers' stand, erected at an elevation facing the entrance to the plant, the program incident to the unveiling of the trophy was resumed at 2 p. m.

Among those present who participated in the dedication exercises were, J. R. Fairman, manager of the Eastern offices of the Portland Cement Assn.; Judge William H. Golding; President F. W. Kelley and Vice-President and General Manager John J. Porter.

At the conclusion of the speaking program the entire assemblage moved to the ball park, where a most interesting first-aid contest was staged with the following teams entered; Glen Falls Portland Cement Co., Glen Falls, N. Y.; Universal Atlas Cement Co., Hudson, N. Y.; North American Cement Corp., Catskill, N. Y.; North American Cement Corp., Howes Cave., N. Y.

Honors went to the Catskill team of the North American Cement Corp. with a score of 96.65 per cent. This team has won seven out of eight contests in which they were entered. Their instructor and former captain, William Roscoe, was formerly of Howes Cave. Second place to the team from Glen Falls with a score of 96.4 per cent. with the Howes Cave team third with a score of 95.65 per cent. The Catskill team was presented with a silver cup, the gift of A. R. Couchman, safety director of the North American Cement Corp.

Many other games and contests were staged during the afternoon, among which the tug of war, participated by teams from the quarry and mill of the Howes Cave plant, attracted its share of attention and resulted in a slight margin of victory for the mill team. At 6:30 a box luncheon was served to those remaining, while a soft-drink stand provided drinks for the thirsty crowd throughout the afternoon. The day's celebration was concluded with a dance.

Proposed Reductions in Freight Rates Suspended

Proposed reductions in the freight rates on sand, gravel, stone, chert, and other nonmetallic minerals, when moving over two or more of certain named southern railroads, have been suspended from July 14, 1931, to February 14, 1932, by the Interstate Commerce Commission.

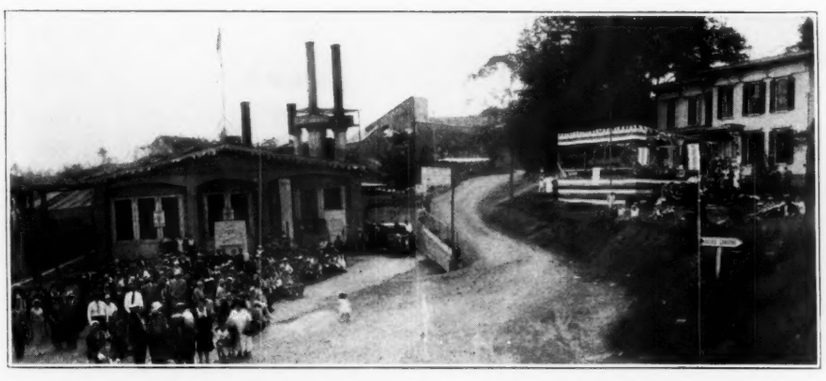
The reductions proposed are carried in supplement No. 105 to J. H. Glenn's tariff I. C. C. A-655, and are suspended under the commission's Investigation and Suspension Docket 3625. The railroads involved proposed to apply the single-line scale of rates on the commodities named in lieu of the joint-line rates when the traffic moved over the following railroads:

Atlantic Coast Line; Atlanta, Birmingham & Coast; Atlanta & West Point; Charleston & Western Carolina; Carolina, Clinchfield & Ohio; Clinchfield & Ohio Railway of South Carolina; Clinchfield Northern Railway of Kentucky; Columbia, Newberry & Laurens; Georgia Railroad, and Western Railway of Alabama.

Utilize Lead-Mine Chats in Manufacture of Brick

The Komnick Process Brick Co. has been formed at Festus, Mo. and is soon to erect a plant for the manufacture of clayless brick, according to Albert Seelig, president. Ground chats, obtained from the lead and zinc mines in that region will be the chief raw material employed, together with silica of sand and lime.

William Becker, secretary, has established offices in the Boatmans Bank Bldg. at St. Louis.



Scene at the dedication of the Howes Cave plant safety trophy.

Urges Lower Cement Rates in Southwest

I. C. C HEARS RECOMMENDATION

A recommendation that the Interstate Commerce Commission require railroads in the southwest to establish reduced rates on cement, in carloads, from the Kansas gas belt and Dewey, Okla., to points on the Texas-New Mexico Railway, and from Ada, Okla., El Paso, Cementville, Longhorn, Eagle Ford, and Harrys, Tex., to points in New Mexico on the same railway, has been made to the commission by examiner Morris H. Konigsberg.

The examiner's recommendations were made in a proposed report on Docket 23898, Iola Cement Mills traffic Assn., et al. vs. Atchison, Topeka & Santa Fe Railway, et al. The report also embraced Docket 23899, Southwestern Portland Cement Co. vs. Texas & Pacific et al; Docket 23902, Oklahoma Portland Cement Co. vs. A. T. & S. F. et al.; Docket 23995, San Antonio Portland Cement Co. vs. I.-G. N. et al., and Docket 24133. Republic Portland Cement Co. v. G. C. & S. F. et al.

In addition to recommending a reduction in rates, Mr. Konigsburg said the commission should award reparation to the Dewey, Oklahoma, Southwestern, and Republic Portland Cement companies.

The rates recommended by Examiner Konigsburg were the so-called Scale IV rates prescribed by the commission in Oklahoma Portland Cement Co. vs. D. & R. G., 128 I. C. C. 63.

The examiner pointed out that the Scale IV rates had been prescribed by the commission for application from Ada, Okla., to points in Texas on the Texas-New Mexico Railway. The railroad witnesses, he said, admitted there was no difference in traffic and transportation conditions as between Texas and New Mexico on the line of the Texas-New Mexico.

He said the primary question for determination in the case was whether the defendants should be required to extend the Scale IV basis of rates from the Kansas gas belt to the destination points involved in view of the fact that such a basis was already applicable from competitive producing points, as well as an extension of the basis from Texas producing points to points in New Mexico only about 58 miles further than the scale at present.

In the Oklahoma Portland Cement Co. case, he said, the commission recognized the fact that as between cement manufacturers competition is "exceedingly keen" and that a similar competitive situation existed throughout the country.

"Any basis of rates from one producing point that is relatively lower than from another competing point in territory where transportation conditions justify the same scale, unduly prefers one to the prejudice of the other," Mr. Konigsburg declared.

Building Awards for Six Months Decline

REACH TOTAL OF $1,808,226,800

June added $331,879,700 to construction contracts awards for the 37 states east of the Rocky Mountains, bringing the sum total for the first half of the year up to $1,808,226,800. F. W. Dodge Corp. in announcing figures for June and for the half-year period indicates that residential building fared best among the three major construction classes in both the second quarter and the first half of the current year. For the first half of the year the loss in residential contracts was 15 per cent. when contrasted with the corresponding period of 1930.

"Real hope is afforded in the outlook for construction as a whole for the third quarter," the bulletin reads. "In our opinion this period will show the best quarterly comparison to date with the like period of 1930. Though we anticipate a decline, the loss will probably not exceed 20 per cent. This would contrast with realized losses for the first and second quarters of 24 and 37 per cent., respectively."

As is usual Metropolitan New York and vicinity lead among the thirteen Dodge territories with $407,540,500 for the six months period, followed by the Chicago territory with $200,435,600 and by the Middle Atlantic territory in third place with $191,547,400.

The only individual class of building to gain during the first six months of 1931 as compared with that period of 1930 was public buildings which showed $74,451,400 in the current year, against $62,322,300 in 1930.

The New Orleans territory makes the unique showing of a gain for the six months of 1931 as compared with a like period of 1930. $86,329,300 is the 1931 showing for the half year, against $63,614,500 in 1930. Of this amount $5,482,200 was placed in residential building, $13,011,900 in non-residential building, and $67,835,200 in public works and utilities.

Spurting ahead of May's $306,079,100, the month of June divided its $331,879,700 among the three major classes of construction as follows: residential, $72,744,700; non-residential, $104,623,000; and public works and utilities, $154,512,000.

Both the Texas and the New Orleans territories are well ahead of June of last year with the month's record. These two territories also show a gain over May. Gains over May are shown in the Middle Atlantic territory, the Southeast territory and the St. Louis territory.

Proposed Rate Rise May Not Hit Road Materials

The proceedings covering the proposed 15-per cent. increase in all freight rates except on coal and coke, will be known as Ex Parte 103 instead of Docket No. 24,520, as announced in the last issue of PIT & QUARRY. The docket number will be used in another case. Another suggestion has been made as to the manner of increasing the revenues should the Interstate Commerce Commission decide that the carriers are entitled to increased earnings, and that is that a flat charge of so much per car be made on all carload traffic. It is contended that this would encourage heavier loading of cars and would not interfere with the carriers' efforts to bring back the less-than-carload business that has been lost or is being lost to motor trucks.

Hearings in this case started July 15, and were confined to receiving evidence supporting the increase. Hearings for the purpose of cross-examination of the witnesses in the initial hearings, and for submission of evidence by protestants will begin August 31, and will probably be held in various sections to allow all shippers to be heard with the minimum traveling expense to themselves.

It does not seem possible that any rates will be made applicable on a decision in this case before the last of the year, and that there will be many exceptions to a flat-percentage increase. One railroad-traffic official has informally stated that in his opinion road-building materials can not stand any increase.

Raw Mill at Riverside Cement Plant Suspends

While the raw end of the Crestmore, Cal., plant of the Riverside Cement Co. has suspended for a period, commencing July 1, cement will continue to be ground as needed from the large stock of clinker on hand, according to Earle MacDonald, general superintendent.

In order to maintain employment as far as possible, some plant and quarry improvements will be carried out during the shutdown period, it is stated.

Superintendent MacDonald expressed the opinion that the duration of the raw-end shutdown would not continue longer than necessary, and that present stocks would be exhausted by September.

Attention was directed to the fact that no reduction in wage scales had been made by the company and that no cut in wages was contemplated.

San Jose Asks Bids on $2,000,000 Cement Plant

Bids have been asked on a general contract by the San Jose Cement Co., Ltd., of San Francisco, for a new cement plant to be constructed on a site recently acquired about eight miles from San Jose, Cal. The bidders are asked to submit figures on the cement- mill proper and accessory structures, including a power house, machine shop, pumping plant and other units, to cost close to $2,000,000 with machinery.

Superior to Continue Production at Seattle

TOTAL CAPACITY 3,000,000 BBL.

Production will be continued at both the Seattle and Concrete, Wash., cement plants, according to E. J. Lucas, president of Superior Portland Cement, Inc., which formally took over operation of Pacific Coast Cement Co., properties recently.

The company, Mr. Lucas said, will continue to make Superior Portland cement at Concrete and will continue the trade-name "Diamond" in connection with the production of the Pacific Company's Seattle plant. Limestone for the Seattle operations will be brought from the quarries at Dall Island, Alaska.

In commenting on the operating lease, Mr. Lucas points out that it will benefit both companies involved, through economies effected by the consolidation of manufacturing and sales activities. Speedier service on cement shipments will be made possible to dealers and contractors.

"Superior Portland Cement, Inc, was originally incorporated in 1906 as Superior Portland Cement Co.," Mr. Lucas explained. "In glancing back over its past history, it is interesting to note that it has been the focal point for several major operations in the cement industry in the Pacific Northwest.

"In 1918 Superior purchased the cement mill of the Washington Portland Cement Co., located at Concrete. In 1925 the reorganization of the company was accomplished, which resulted in a widespread distribution of the company's stock along the Pacific coast. The leasing of the Pacific Coast Cement Co. marks the beginning of what might be termed the fourth era of its development.

"The Superior plant at Concrete is the largest and oldest in the northwest, with an annual capacity of around 2,000,000 bbl. To this can now be added the capacity of the Seattle unit which is approximately 1,000,000 bbl. a year."

Glass-Sand Deposits in Los Angeles Area Sought

Los Angeles and Southern California's glass industry may be freed from dependence upon importations of Belgian glass sand, according to Lewis B. Skinner, consulting engineer of Denver, who has been retained by Los Angeles interests to investigate glass-sand deposits near that city and report upon the feasibility of establishing a plant for treatment of the raw material.

According to Mr. Skinner, adequate supplies of good sand are available within fifty miles of Los Angeles, and the sand, if treated for the removal of iron content, will be as good for glass-making purposes as imported sand, as well as being considerably cheaper.

Editorials

Association Membership

THE extent to which producers in all lines are losing interest in trade-association work is astonishing and alarming. Resignations are understandable when viewed merely as evidences of retrenchment policies, which, in times like these, display more lack of confidence than reasoned judgment. But it is inconceivable, unless one takes a very cynical view of business men's intelligence, that men should withdraw, when their support is most needed, from membership in those organizations which, because of present conditions, are more essential to industrial stability and solidarity than ever before. Such action can not be explained on any other theory than the hysteria of the period, which is blinding men to facts and making dispassionate judgment difficult if not impossible.

The trade-association idea is dependent for its success on acceptance of the theory that men engaged in a given line of business have more points of similarity than of difference, that such differences as exist can be amicably composed, and that they have much more to gain by concerted effort than by individual striving. In times of business stress, when the rules of the jungle threaten to upset the acquired habits of civilized activity, individualism runs rampant. It is this very individualism with all its horrors that trade associations, within the sphere of their work, try to control, and it is regrettable that now, when their work can be most useful and when it is most difficult to carry it on, those on whose support they depend should impair or destroy their effectiveness by lack of coöperation.

Even where this temporary indifference to the great value of trade-association work does not show itself by resignation from membership, it reduces the effectiveness of that work by the failure of members to attend meetings even when these are of great importance and therefore impose exceptional obligations on those who are given executive privileges and responsibilities. This is to be regretted even more than the withdrawal of financial support, because, while many can contribute money, only a few can contribute counsel, and wise counsel is badly needed to-day.

Some of those who continue to carry the burdens of trade-association activities, in spite of reduced income and the necessity for economizing in all directions, sometimes speak harshly of those whom they term the "free riders," the "noncoöperators," who gladly share the benefits of association efforts but refuse to share in the costs of furthering those efforts. But we do not think that this failure to coöperate arises as much from poor sportsmanship as it does from a lack of understanding of what trade associations can do for the small member as well as the large one. Trade-association officials have striven to educate non-members in the ways and advantages of association membership, but too often their pleas have fallen on ears that were deaf as well as on ears that were not attuned to ideas of coöperation and coördination.

This period is subjecting trade associations to every test that unfavorable conditions could impose. In addition to the financial loss of shrinking membership, there is the loss in *morâle* occasioned by what appears to be a waning of faith, and this can be rapidly destructive of trade-association usefulness. Trade associations are fighting bodies; they must reconcile differences within their ranks as well as oppose dangers from without. They require, therefore, courage, confidence, faith, and the strength of numbers. Producers with even the faintest understanding of the values of coöperation and even the slenderest incomes will not now desert those organizations which have been erected at such great cost of time and effort, which have proved so useful in good times and bad, and yet which may, through lack of financial and moral support, quickly shrink and disintegrate.

More Specifications

THE blessings of the scientific age are not unmixed. Along with the genuine advance of true science, we are forced to accept, at least temporarily, a vast amount of pseudo-science, and the nonmetallic-mineral industries are no exception. At present we are in the midst of a growing demand for specifications, which call for ever-increasing detail and confusion without much regard to the value or necessity of such requirements. Hot cement is, we believe, the most recent addition to the long and rapidly-growing lists of things that are demanded and things that are taboo.

This newest form of specification, insisted upon by some cement users, such as highway departments, requires that cement, on reaching the job, shall have a temperature not above 125 deg. Fahrenheit. If this specification is insisted upon we may confidently expect to see motor trucks and other cement-carrying vehicles equipped with some artificial cooling means, for it is easily possible, under current rapid-delivery practices, for cement to retain a large part of the heat it acquires in the kiln and grinding departments. The effect of this heat on the strength and durability of concrete, whatever it may be, is still, as far as we know, a matter of conjecture, in which the opponents of the idea may show as little reason and as much prejudice as the proponents.

In our opinion, there are already too many ill-considered specifications surrounding the production and use of nonmetallic-mineral products. Many of them are conceived in the absence of conclusive experience data and, as a result, are adopted and enforced without regard to the hardships they impose

or the necessities, real or fancied, that lie back of them. We have no private means for investigating the merit of any set of specifications, but logic tells us that, where so many authorities disagree, it is impossible that they all should be right and extremely probable that all are wrong.

Producers are being afflicted with a maze of pseudo-scientific requirements that can not be reconciled with experience or with each other. For the most part, we suspect, they are based on very limited observation, on meager and inadequately tested and verified data, and they reflect opinions and prejudices rather than precise knowledge. In its determination to investigate the hot-cement theory the Cement Committee of the American Society for Testing Materials has shown not only good sense but the true scientific spirit, and it will undoubtedly learn enough to enable it to place a proper valuation on the demands now being made. The national associations of cement and aggregate producers are well equipped for studying problems of this kind; they have the talent and the physical facilities to make a thorough investigation and, except possibly where their competitive interests are involved, they are able to view the subject with that degree of objectivity essential to an honest search for the truth. We think we express the sentiments of all producers when we say that we hope the specification bugaboo will soon be given its correct proportions and that those who sponsor existing and future specifications will be compelled by the light of exact knowledge to justify or withdraw their demands.

Accident-Prevention Work

ACCIDENT prevention has demonstrated its tremendous value to industry and public welfare, and the scoffers who assailed the idea, at first mildly and later with vehemence, have for the most part been silenced by the overwhelming evidence of measurable gains. Habits and traditions are not easily eradicated, even in this age of boasted intelligence, and there are still many employers who display less interest in their workers than in their machines. Happily, this situation is rapidly changing, not on account of any humanizing influence exerted on human nature by the preachers of humanitarian doctrine, but rather because neglect of the accident problem leaves its mark on the profit account. On the score of financial gain, accident prevention has earned its way and proved its case.

Yet, much, of course, remains to be done. Data recently published by the National Safety Council, to whose splendid work much of the progress made in accident prevention can be attributed, show the wide differences that still exist between the accident-frequency and the accident-severity rates of different industries. The results attained seem to bear less relation to the accident hazards common to these industries than to the attitude of employers toward accident-prevention work. Thus, the cement industry, which has made such a remarkable showing in accident prevention—the records show that it has the lowest accident-frequency rate of twenty-eight industries—is not, on the whole, a safer industry than some others with much poorer accident records. The hazards in the food industries, for example—and this excludes meat packing—are certainly no greater than those in the cement industry, yet the accident-frequency rate of the former is nearly three times as great as that of the latter. Even the quarrying industries, which present hazards much greater than those common to the refrigeration industries, have an accident-frequency rate only about two-thirds as great.

The figures on accident severity disclose the fact that the cement industry, which heads the list of accomplishment in reducing the accident-frequency rate, is in a class with the steel, petroleum, railway car-and-equipment, and foundry industries, in which workers are exposed to severe but not many hazards. In this respect, quarries show an accident-severity rate of 3.30 days lost per 1,000,000 man-hours, a figure exceeded only by the woodworking-and-lumbering, marine, construction, and mining industries. In accident frequency, however, their rate of 23.46 injuries per 1,000,000 man-hours stands in the nineteenth place from the top of the list, exceeding that of other industries, such as steel, machinery, metal products, chemicals, public utilities and electric railways, which are generally considered very hazardous.

Accident-frequency rates are more likely to reflect the extent to which accident-prevention work has been adopted and pursued than accident-severity rates, which bear a closer relation to the hazardous nature of the work and are less quickly affected by accident-prevention programs. This is well illustrated by the cement industry, in which the frequency rate, due largely to intelligent and unremitting work on the part of the industry's association and its members, is only 6.30 injuries per 1,000,000 man-hours, while the severity rate is 2.43 days lost per 1,000,000 man-hours. The corresponding figures for all twenty-eight industries are 18.47 and 1.97.

The United States Bureau of Mines, through its work among quarries, is making great progress in lifting the quarrying industries to a high appreciation of accident-prevention work, but the task has proved more difficult than in the cement industry, which has set a shining example, not only for other nonmetallic-mineral industries but for outside industries as well. The success of the cement industry in reducing the toll of accidents results partly, of course, from the fact that the industry is small in number of plants compared with the quarrying industries, for example, while the average size of the companies involved is much larger in one case than in the other. This condition has been an important contributing factor in accident reduction for the reason that the larger organizations have been able to employ a higher type of department heads and to carry on accident-prevention work in a more systematic and persistent manner. They are likewise more accustomed to a consideration of theoretical problems and to a proper evaluation of ex-

perience data, because of their great dependence on engineering and technical skill. As the level of technical knowledge and ability rises in the quarrying branches of the nonmetallic-mineral industries —and the last few years have witnessed great improvements in this respect as the recognition of the importance of special training has grown—the record in accident-prevention work is certain to become better, particularly with respect to accident frequencies.

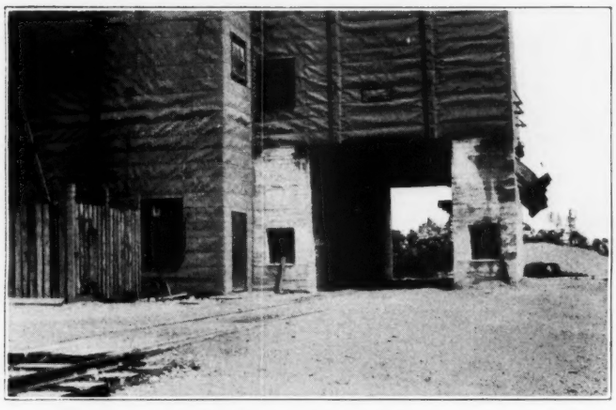
Accidents constitute a large share of the cost of production except in those plants which have made marked progress in their prevention. Although this fact may be and undoubtedly is well understood, the methods by which the situation can be remedied are not so well known, in spite of the untiring efforts of the organizations interested in promoting safety work. In many cases the mental attitude of those responsible for the adoption of modern and effective accident-prevention methods is not receptive of new ideas; in many others there is sufficient receptivity but not enough determination. The cement industry has shown itself possessed of both qualities in a high degree, and has set high standards for emulation by the quarrying industries. In these days, when the costs of production have been and are being scrutinized as never before, the frequency and severity of accidents, which levy such a heavy tax on all types of industry, must receive a still greater share of attention. They offer a certain and lasting means of effecting important economies in production costs.

Develops Ontario Limestone Deposit Revealed Before World War

The Decewsville Crushed Stone Co. of Decewsville, Ont., is operating a crushed-stone plant on a 30-acre deposit purchased from Grand Gypsum, Ltd. of Hamilton, Ont. The plant was opened last summer and is producing crushed limestone of extreme hardness and high-calcium content from its quarry located close by.

View in the stone quarry showing shovel and cars. Incline to crusher at right.

Existence of the deposit was discovered in 1912 when test borings were made by Grand Gypsum, Ltd. That company also located extensive gypsum deposits a short distance away and had planned to develop those, but the war called a halt to the program and the plans have since never been revived.



Tunnel for car-loading and chutes, at right, for loading motor trucks.

In 1929, however, the Decewsville company was formed, the limestone portion of Grand Gypsum's holdings was acquired, and work on the crushed-stone plant and quarry was started. As the accompanying photographs show, stone is loaded by power shovel to cars, which are drawn up an incline into the crusher house. An Allis-Chalmers McCully crusher is used for primary reduction. The secondary crusher, too, was supplied by Allis-Chalmers.

The Canadian National Railway passes the property and a spur track was built, running under the storage building, for loading cars for shipment of stone by rail. Trap doors overhead are used to fill the cars, while chutes from the same bins are located along the outside of the storage building for truck-loading. A road was constructed from the plant to the Provincial Highway No. 3 to allow trucks to enter and leave the premises.

The inclined runway to the plant.

R. E. Haire is president of the Decewsville company. F. W. Schwendiman is vice-president. Percy N. Hill is secretary. M. Schwendiman is superintendent of the plant and quarry.

Improvements at Maryland Cement Plant Bring Down Production Costs

The Security plant of the North American Cement Corp.

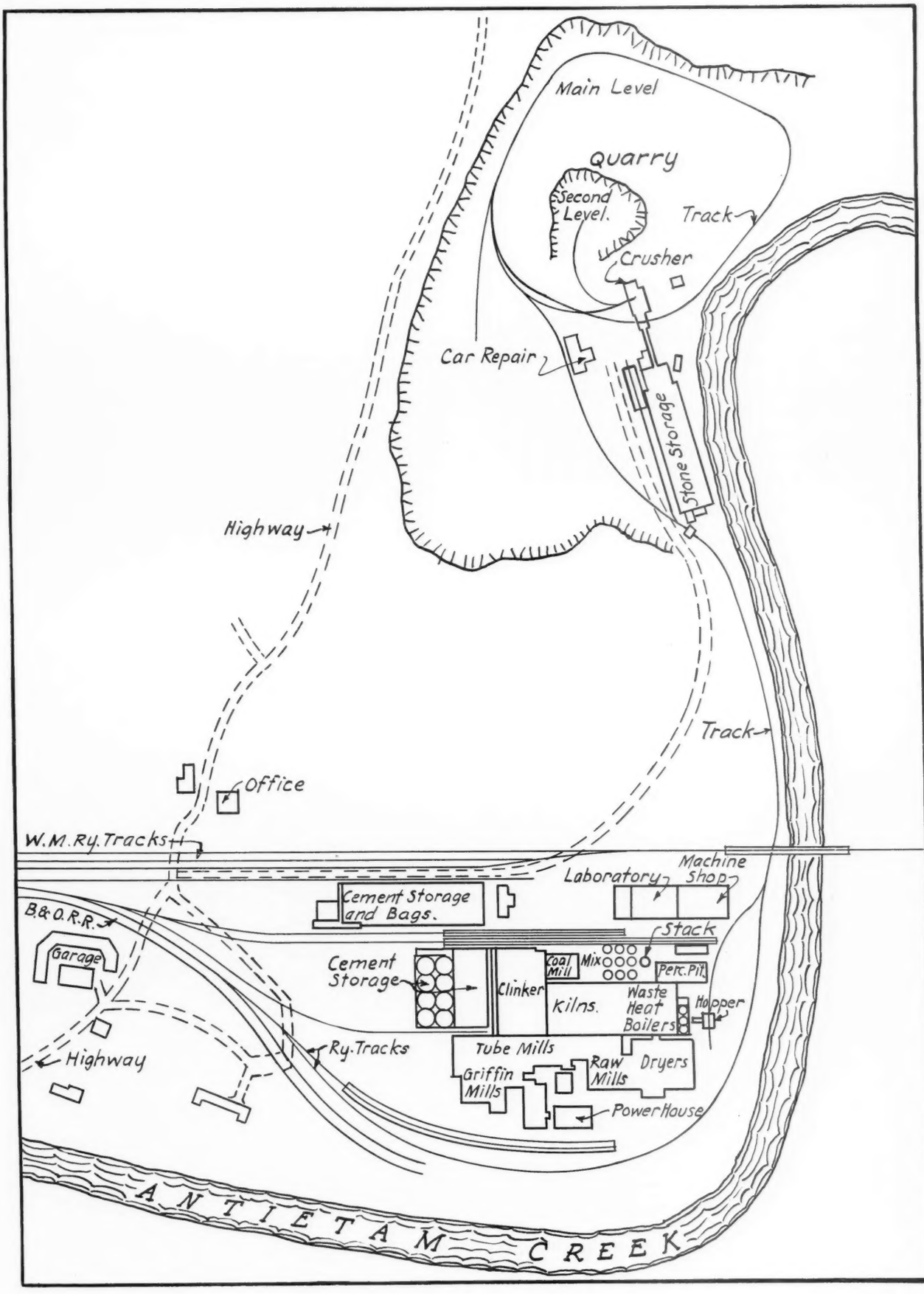
Waste-Heat Boilers, New Power Plant and Dust-Collecting System Now in Operation

By M. F. BEISBER

AFTER a period of more than three years during which major improvements were made in practically every department, the Security, Md., plant of the North American Cement Corp. offers an interesting study in what can be done in the way of modernizing a 24-year-old dry-process cement mill. Such improvements—made principally for the reduction of production costs—fit well in the picture of 1931 conditions in the cement industry. To-day railroad rates are not alone in determining the territorial limits of the mills; present price conditions, allowing extremely narrow profit margins, have placed production costs more and more in the focal point of attention. The drive for greater production economy has been based on two methods: (1) Increase of capacity for the same production cost, and (2) maintenance of the same capacity at lower production costs. Obviously, the cement industry needs no increase in capacity, and many so-called improvements result in no more than a slight increase in that direction. In checking over the improvements at the Security plant, it will be noticed that they have been made expressly for the reduction of power and maintenance costs as well as for the improvement of the finished product. Capacity has not been materially increased, the mill having a daily output of 5,000 bbl.

The new precipitator building is seen immediately left of the stack. At the extreme left is the new stone-receiving department.

Possibly the most important of the improvements made was the installation of a waste-heat-boiler plant and a new power-plant. This improvement, made in 1928, renders the Security plant normally independent of outside power sources; in fact, power in excess of its demand is now being generated by the company. In March, 1929, a new tube-mill was installed in the clinker-grinding department to meet specification requirements for the grinding of finer cement. Shortly afterward, the secondary crushing equipment was replaced by a modern, dustless hammer-mill installation. The Autumn of 1930 saw the installation of a Hardinge conical mill in the raw-grinding department, the first unit of several which will eventually displace all the equipment formerly used in this phase of cement making. The latest improvement, completed in March of the present year, places the company higher in the esteem of neighboring property owners through the installation of electric precipitation equipment for the elimination of the stack-dust nuisance. An extensive program of improvement such as this could not have been carried out without capable planning and direc-



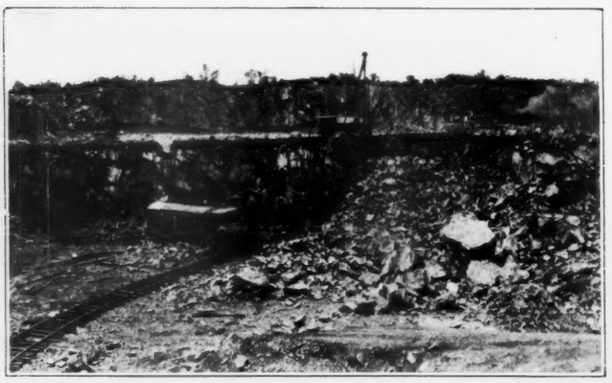
Mill and quarry layout of the Security, Md., plant.

tion. To E. S. Guth, the southern district manager for the North American Cement Corp., the improvements were but definite steps in a program of necessary modernization. He is ably assisted by Paul H. Leichel, assistant superintendent at the Security plant.

Not the least of the improvements are those made in the quarry. A trying problem of quarry transportation was solved through a simple method of routing trains. Also a new level has been recently opened in the quarry floor, thus spreading operations to 2 levels in widely separated locations.

At the Security plant the crushing department is operated as part of the quarry operations. In fact, commercial crushed stone is also produced and a steel storage-and-loading bin is provided for handling 500 tons of this material. In a concrete storage bin 11,200 tons of cement stone can be stored accessible by tunnel conveyors for the cement mill. Since 1,500 tons of rock are produced and crushed daily, the stone-storage provision allows a differential of more than a week's supply of cement rock.

The company's quarry is roughly square in shape, with a face varying from 30 to 75 ft. in height. Its working perimeter approximates a half-mile. Directly in front of the primary-crusher building a new level has been started. Up to the present time the new level has been lowered to a point 38 ft. below the original floor and eventually it will reach a level 12 ft. lower.



Operations at the new quarry level.

Three well-drill rigs, one of which is stationed on the new level operation, do the blast-hole drilling. Two are Keystone steam-driven units and the third is a Loomis Clipper unit electrically driven by a 15-hp. Ideal motor. Six-inch blast holes are standard at this quarry. With 60-per cent. gelatin loaded in the bottoms of the holes and 40-per cent. Red Cross (Du Pont) dynamite in the tops, an average yield of 3.75 tons of rock per pound of explosives has been obtained. From 20 to 47 holes are shot in any one blast, with the exception of those at the new level, at which a smaller number is shot in proportion to its development. The limestone produced varies from 74 to 96 per cent. in $CaCO_3$ content.

For loading the blasted rock the company operates three Marion shovels. Two are steam-driven railroad-type units, one a 100-ton No. 75 machine having a 3½-cu.yd. dipper, the other a No. 60, 80-ton

Crushing plant as seen from the quarry.

unit having a 2½-cu.yd. dipper. The electrically driven machine is a Marion No. 70, 110-ton, equipped with a 3¼-cu.yd. dipper. A Thew ⅝-cu.yd., 22-ton, steam shovel takes care of stripping and clean-up needs.

Originally a single track extended from the primary-crusher house to the shovel locations in the quarry. Naturally, a delay in loading occurred in waiting for the return of a train with empty cars. To offset the delay, a loop track was built on the quarry floor, the loop returning to the main track leading to the crusher incline. A locomotive on its way to the shovels tows a train of "empties" behind. Upon reaching the shovel position the loaded cars are pushed ahead and several "empties" detached from the rear of the train. Unfortunately the quarry cars, which carry 10-ton loads, dump from one side only. Each time a loop circuit was made, the cars arrived at the crusher incline turned around, much to the consternation of the quarrymen. Later, quarry operations forced the abandonment of the loop on the quarry floor, and the sub-

Secondary crusher for the production of commercial stone.

stitution of a larger one which includes the crusher house, and all difficulty has been eliminated. A Vulcan No. 20 saddle-tank locomotive runs on the quarry track system.

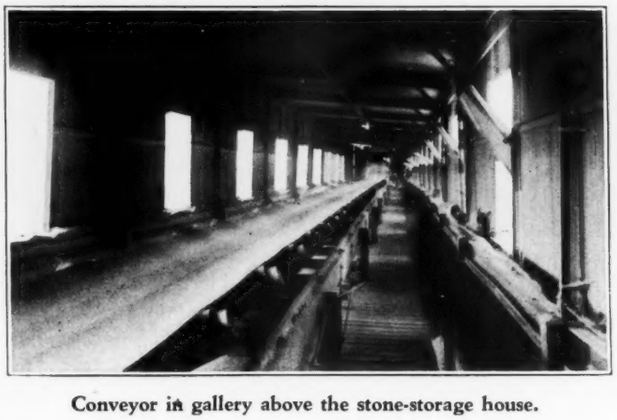
At the primary-crusher house a Flory 48-in. drum hoist with 600 ft. of ¾-in. wire rope draws one car at a time up the incline to the crusher hopper. The new level is, for the present, served by a single steel quarry car attached by a wire rope to a McLanahan

single-drum hoist, which brings the car to a position where the Flory hoist can draw it to the hopper. The Flory hoist is powered by a 125-hp. motor and the McLanahan unit by an 82-hp. motor. Upon reaching the top of the incline, the car strikes a small truck, thereby forcing it forward. The truck raises a counterweight, which, after the quarry car is dumped, imparts sufficient power to return the car to the incline, where it returns by gravity to the "empty" track.

Stone storage and transfer-car-loading hopper at the crushing plant.

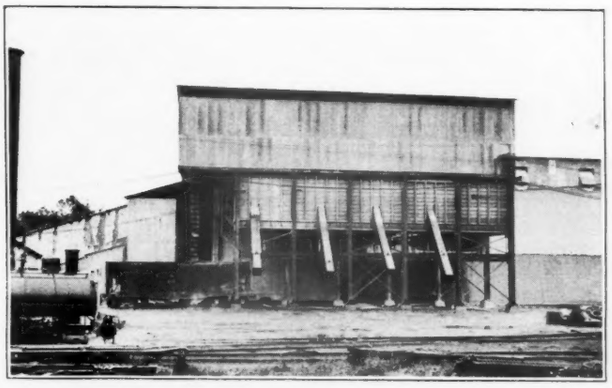
The primary crushing of the shovel-size rock is done by a Blake-type Allis-Chalmers 48-in. by 60-in. jaw crusher, which operates at a speed of 156 r.p.m. and is driven by a General Electric 200-hp. motor. From the jaw-crusher the crushed rock is sent to the secondary-crushing department in an adjacent building via a 48-in. belt conveyor 120 ft. long between centers. This conveyor is built on a 17-deg. rise so that the rock is elevated to a height of 37 ft. 6 in. It runs at a speed of 230 ft. per min. and is driven by a 40-hp. motor.

Material reaching the secondary-crushing department is directed either to a hammer-mill for the production of raw cement stone or to an Austin No. 7½ gyratory crusher. The latter, which is driven by a 75-hp. motor, reduces the stone to sizes below 2½ in. This material, termed "commercial stone," is then delivered by a 26-in. belt elevator to a revolving screen above the steel loading-bin structure which is located adjacent to the secondary-crushing building. Five sizes of commercial stone are separated by the revolving screen which is 5 ft. in diameter by 56 ft. 6 in. in length. For these materials five bins, each measuring 11 ft. by 16 ft. by 12 ft. high and storing 100 tons, are provided in the bin structure. Shipment of the commercial stone is made in railroad cars loaded from an adjoining track. Proportioning of various sizes of stone is accomplished by means of a 36-in. belt conveyor which has access to each of the bin gates. Both the revolving screen and the belt-bucket elevator are driven by a 60-hp. motor.



Conveyor in gallery above the stone-storage house.

Stone for the cement mill is sent direct from the primary-crusher conveyor into a hopper mounted above a Pennsylvania SXT 14 hammer-mill. The latter is supplied by a No. 50 feeder of the same make which is independently driven by a 20-hp. motor. The hammer-mill, direct-driven by a 400-hp. General Electric motor, reduces the stone to sizes varying from minus 1 in. to minus ¾ in. depending on the condition of the hammers. Dust has been virtually eliminated from the secondary-crushing department through the installation of a Pangborn dust-collection system. All sources of dust, the hammer-mill, feed-hopper and the like, and even the head-pulley discharges of the conveyors, are connected to the collector system.



Screening house and, below, storage bins in the commercial-stone department.

The crushed material from the hammer-mill is then sent to the cement-stone storage house, via a 30-in. belt-bucket elevator which, in turn, discharges to a 228-ft. conveyor extending over the storage building. The elevator has a 46-ft. lift at an angle of 65 deg., is fitted with 30-in. by 12-in. by 15-in. buckets, and is driven by a 40-hp. motor. The conveyor above the stone storage house has a 36-in. belt which travels at 220 ft. per min. and is driven by a 40-hp. motor. A Robins No. 3 tripper discharges the cement stone to any desired position in the building.

The stone-storage building is 230 ft. long and 50 ft. wide with walls 12 ft. high. Two 24-in., 226-ft. tunnel conveyors recover the material through cradle gates, delivering it to a 24-in. cross conveyor which, in turn, feeds the car-loading hopper elevator. The three conveyors in the system are operated at a speed of 240 ft. per min. There are 23 cradle feeders in each tunnel to supply the belt conveyors. From the car-loading hopper, which holds 60 tons of stone, cars are loaded and sent to the mill.

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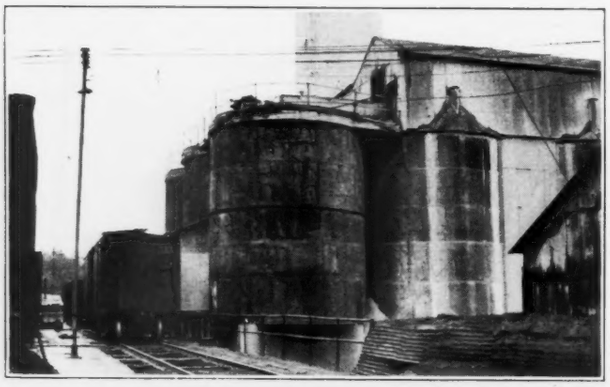
there to be dumped into the stone-receiving system. A single 75-hp. motor drives the tunnel-conveyor-and-elevator system. The stone-transfer cars, operated between the loading hopper and the mill, are two standard-size steel-hopper cars drawn by a Vulcan No. 30 saddle-tank locomotive on standard-gauge track.

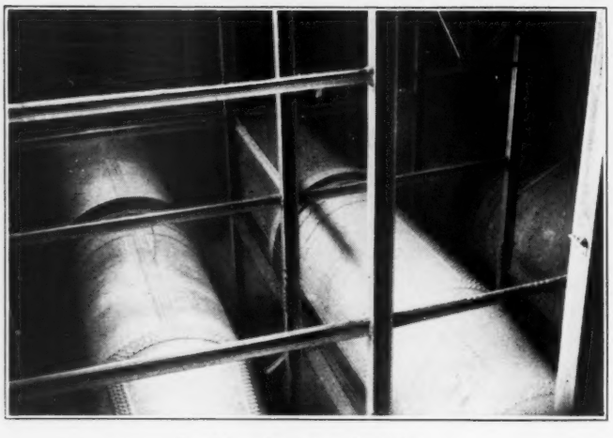
Two other materials are introduced into the raw-material supply system, these being cinders and clay as necessary argillaceous materials. The cinders are obtained from near power-plants in car-load quantities. The clay is obtained from a pit on the company property.

As the transfer cars arrive at the mill, the stone is dumped into a concrete receiving hopper. Fifty tons of stone is held here temporarily, supplying an 18-in. reciprocating cradle feeder which, in turn, feeds a 36-in. belt-bucket elevator. The latter has



The dry raw-stone storage tanks.

a 76-ft. 8-in. lift and travels at 255 ft. per min. delivering the stone to a 1,200-ton concrete bin. The latter acts as a surge bin between the transfer system and the stone driers. Beneath the bin are five 12-in. reciprocating cradle-type dumping gates which supply a 22-in. 66-ft. belt conveyor that discharges to a 32-ft. elevator. The latter delivers the stone to the two rotary stone driers. Also feeding into the boot of the drier elevator is a short 15-in. belt conveyor which adds clay to the stone. The clay is fed by hand to the elevator from a near pile. Tramp iron is removed from the stone supply by a magnet suspended over the conveyor.



Looking down on the kilns.

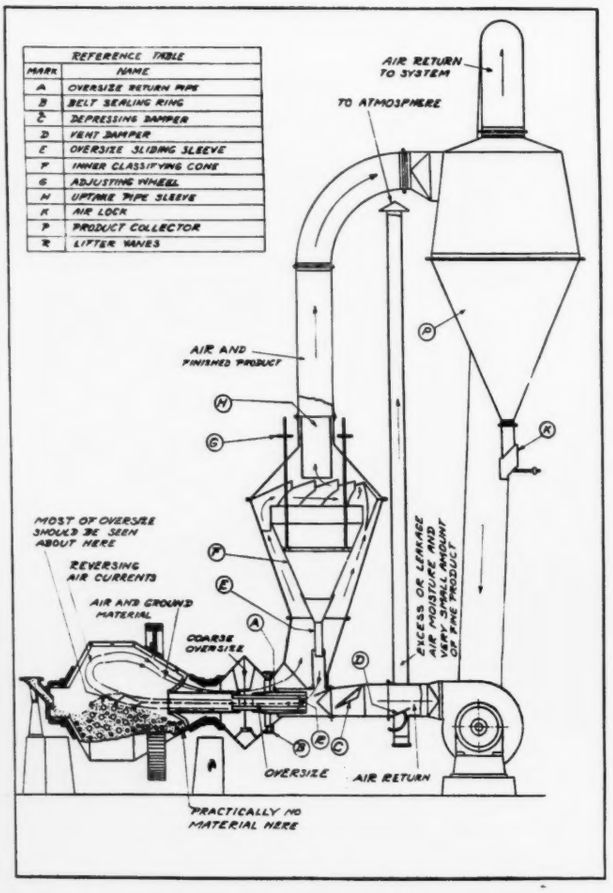
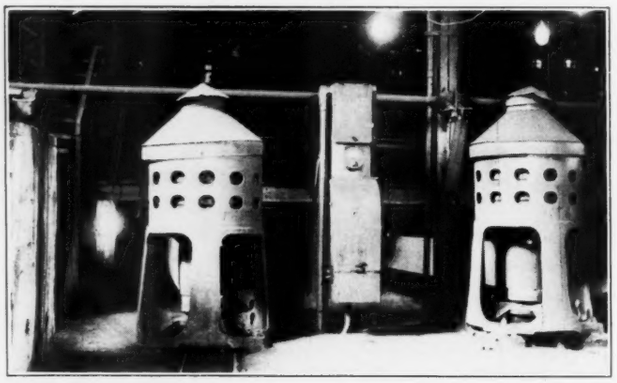


Diagram of conical mill and reversed-flow air-classification system used in raw grinding.

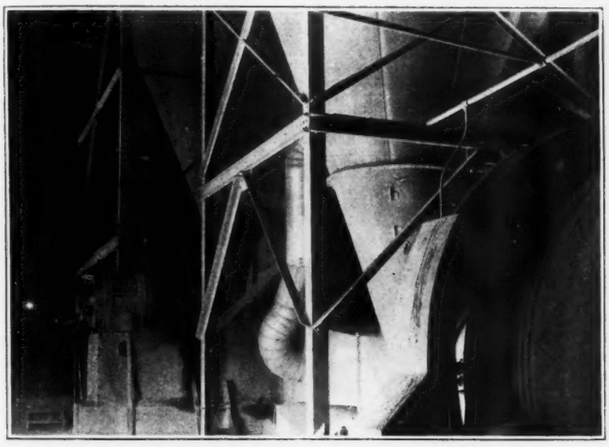


Coal-grinding mills with motors in foreground.

The stone-drier system consists of two Vulcan 5-ft. by 50-ft. driers, a hammer-mill, and a vibrating screen, the last-named operated in closed-circuit which allows nothing but minus ¼-in. dry stone to pass on to the raw grinding department. The two driers are mounted on Reeves trunnions and are driven by one 40-hp. motor. Pulverized coal is burned in the drier furnaces through Fuller-Kinyon burners, air being supplied by 2-hp. motor-driven Buffalo fans. The discharged dry stone is elevated by a chain-bucket elevator (60 ft. on centers with 8½-in. by 18-in. buckets) to a Tyler Hum-mer 4-ft. by 7-ft. vibrating screen. This screen rejects plus-¼-in. stone to a Pennsylvania SXT 8 hammer-mill

from which the crushed material is returned to the screen by the drystone elevator. The hammer-mill is direct-driven by a 200-hp. motor; the dry-stone elevator is driven by a 20-hp. motor through a D. O. James speed-reducer. Minus-¼-in. stone from the Hum-mer screen is sent to a Link-Belt 16-in. chain drag into a system of eight concrete dry-stone storage bins. The drag is 66 ft. long on centers and is driven by a 20-hp. motor through a D. O. James speed-reducer. About 1,400 tons of storage capacity is afforded by the dry-stone bins.

As stated, cinders are received in car-load quantities from near power plants. The cars are brought in on a trestle adjacent to the plant and are dumped

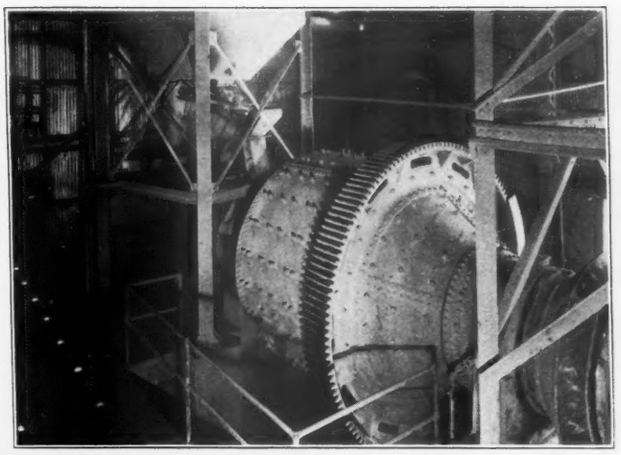


Conical mill, classifiers and blower in the raw-grinding plant.

into a 60-ton trestle bin, from which the cinders are sent through a Jeffery hammer-mill (24 in. by 36 in. in size and driven by a 50-hp. motor), then to a Vulcan drier via a chain drag and an elevator. The drier is similar in size to the stone driers. Two steel tanks with a combined capacity of 173 tons are used for storing the dried cinders. Cinders form 3 per cent. of the raw material at the Security mill.

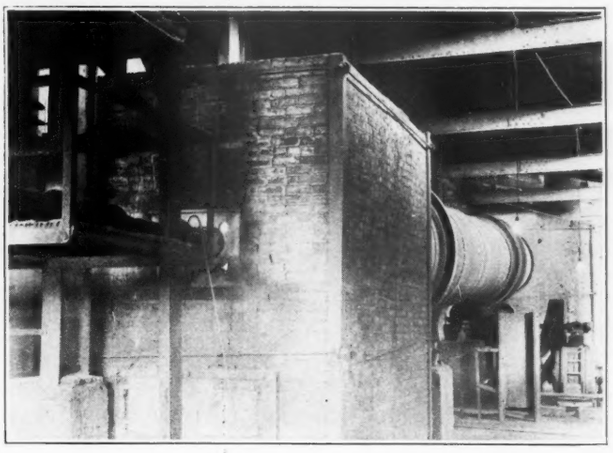
At this point stone is available for the raw grinding department from eight concrete storage bins and cinders from two steel bins. Following first the flow of the dry stone, there are two conveyors beneath the bins which receive stone from any one bin or group of bins according the chemist's directions. These bins are checked hourly by the chemical laboratory and the flow of stone is gauged to conform with the laboratory's formulae. The two conveyors discharge to a 12-in. screw cross-conveyor which feeds a 46-ft. elevator. The latter delivers the stone to a poidometer feed bin in the raw mill building. A feed bin for the cinder poidometer is located near.

A 36-in. Schaffer poidometer automatically weighs and proportions the stone, while a 14-in. poidometer supplies the cinders. The stone is received on a series of two conveyors, one of which is inclined to the Fuller mill feed bin. The cinder poidometer discharges to a belt conveyor which delivers the material to the inclined stone carrier whence both the stone and the cinders pass to the raw-grinding department feed bin—a concrete bin storing 220 tons of raw material.



The conical mill and air-separator installation.

One of the most interesting of the Security plant improvements is the Hardinge-mill installation in the raw-grinding department. This type of mill, known as a conical mill, has had a long record of service in the mining industries, but only recently has made its appearance in cement mills, the installation at Security being one of the first. In operation the mill carries an aggregate load of steel balls as a grinding medium and raw material is fed into the end opposite the cone. Through the rotation of the cone, the steel aggregates and stone receive a decided rolling motion one over another,



Furnace and shell of one of the stone driers.

resulting in a rapid circulation of the mass. Through a means of air separation, the "fines" are blown out of the mill by a reversed-flow air current which goes to rotary classifier, where coarse oversize is returned direct to the incoming air current, the "fines" passing upward to a cyclone collector. For a complete description of the Hardinge mill and its operation see PIT AND QUARRY HANDBOOK, 1931, p. 219.

The Security installation employs a 10-ft. by 66-in. mill which is driven through gear reductions by a 400-hp. motor. It carries a total charge of 27 tons of steel balls, ranging from 3 in. to ⅞ in. in size. The mill receives its raw materials through a Hardinge 2-D constant-weight feeder. For the reversed-flow air-separation system there is a Clarage size

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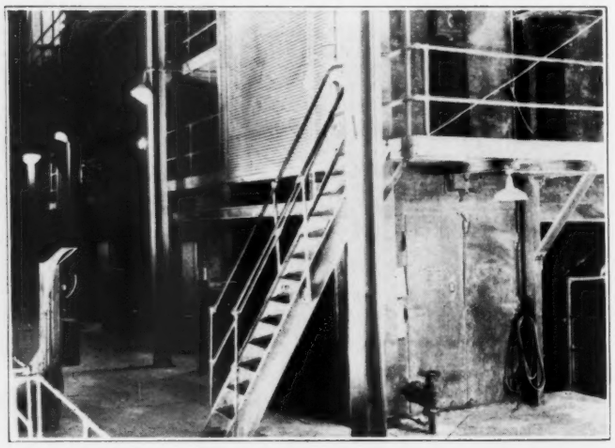
110 fan and a 6 ft. 6 in. rotary classifier. The fan is driven by a 150-hp. motor.

Through the Hardinge mill installation, a higher degree of fineness is obtained at a better gradation. The mill produces 91 per cent. through a 200-mesh screen and 99 per cent. plus through a 100-mesh screen. Not only that, but through the reversed-flow air separation, "fines" to size are continually being withdrawn, including some 16 per cent. of the incoming raw material which is already to size.

Originally there were 18 ball-and-ring type pulverizes in the raw-grinding department. Four were

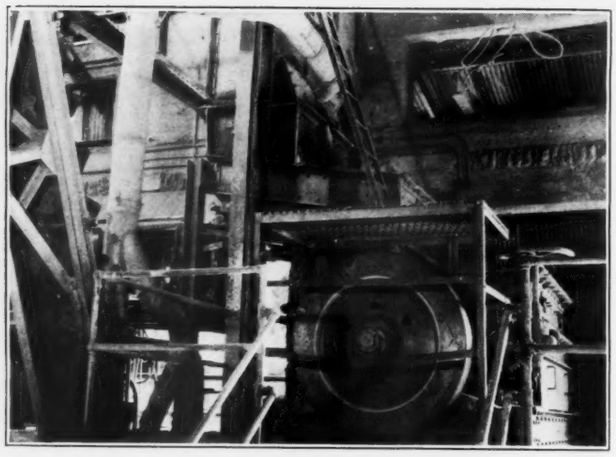


Waste-heat-boiler room. Control board at left.

removed to provide room for the Hardinge mill. The eventual installation, if present plans materialize, will call for three Hardinge mills, replacing all former equipment in the department.

A single 16-in. 66-ft. screw conveyor receives the material discharged from the various mills and delivers it to a 48-ft. elevator, which sends it to a set of raw-mix storage tanks via another 16-in. screw conveyor. As there are nine steel tanks three additional 16-in. screw conveyors are required to distribute the pulverized material to them. A total storage capacity of 2,925 tons is provided by these tanks.

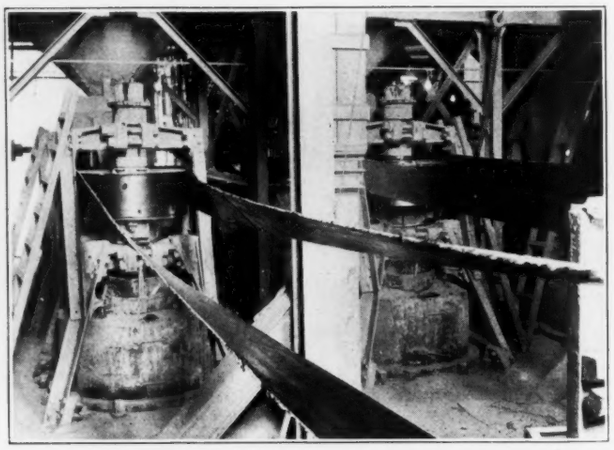
From the tanks the raw mix material is sent to the kiln tanks, one over each of the five kilns. In this conveyor system, there are three 9-in. screws



Hammer-mill for secondary reduction of cement raw materials.

which receive materials from the nine tanks; a 16-in. cross screw, a 16-in., 36-ft. long, main screw, a 48-ft. elevator and a final 16-in. screw 84 ft. long which delivers the raw mix material to the kiln feed tanks. A single 40-hp. motor drives the entire series of conveying units.

Five Reeves 125-ft. kilns are employed for the rock-burning process. Each kiln has a 10-ft. diameter for 40 ft. of its length, a tapered section to 8 ft. diameter for the next 10 ft. of its length, and an 8-ft. diameter for the remaining 75 ft. The kilns are pitched at an incline of ½ in. per linear foot, and are driven by individual specially-wound 59-hp. motors. A central control board on the firing platform provides an accurate means of checking the kilns' operating performance. In addition to the



Scene in the finish-grinding department.

usual front-and-rear draft gauges for each kiln, there are also revolution meters, raw-feed indicators, recording temperature meters which record the gas temperature at the end of the kilns, and CO and CO_2 recorders. When a ring forms inside a kiln, a Remington cement-kiln gun is pressed into service. From 50 to 200 shots of No. 8 gauge bullets are needed to break down a wedge in the ring. After the wedge is broken, the ring quickly collapses. Much time is saved through this newer and more efficient method.

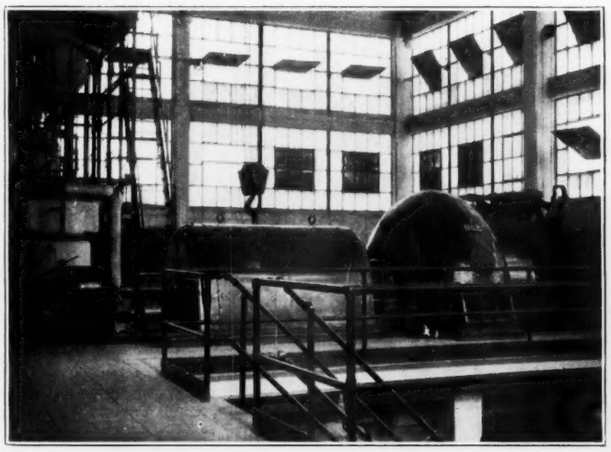
Three elevators receive the hot clinker and discharge it to an open cooling and stock-pile area located directly adjacent to the kiln building. A Niles 8-ton, 72-ft.-span traveling crane, equipped with a clam-shell bucket, attends the stock-piles and supplies the finish-grinding-department hopper with clinker. For emergency needs an American Hoist & Derrick Co. derrick can be used. A space is provided for gypsum storage of 400 tons.

Through a Richardson automatic scale, the clinker is weighed in 100-lb. batches. It is then sent through a Buchanaan type B 18-in. by 12-in. roll crusher driven by a 40-hp. motor. An auxiliary scale on the Richardson unit weighs the required amount of gypsum per batch of clinker, and the two materials are combined and sent to the feed bins supplying the Bradley-Griffin mills via a 12-in. bucket elevator and an 18-in. belt conveyor. The Richardson scale is operated by a 3-hp. motor.

The finish grinding of the cement clinker is accomplished in two steps: (1) through Bradley-Griffin mills, (2) through tube-mills. Above the Bradley-Griffin mills are located four steel bins which store 1,210 bbl. of cement clinker. On opposite sides of the bins are located the mills, five to a side, there being ten in all. These mills are the ring-and-roll type, having 40-in. diameter crushing rings and 24-in. rolls. Four of the mills are driven from one 300-hp. motor; the others are individually belt-driven from 75-hp. motors with the exception of No. 10 mill which is driven by a 100-hp. motor.

From the Bradley-Griffin mills the cement is sent to a set of feed bins which supply the tube-mills. There are five bins in the group, each storing about 270 bbl. of cement. In the tube-mill grinding department, there are four Krupp 6-ft. by 16-ft. units and one Bethlehem 6-ft. by 20-ft. unit. The latter is driven by a 300-hp. super-synchronous motor and the Krupp units are driven by 250-hp. synchronous motors.

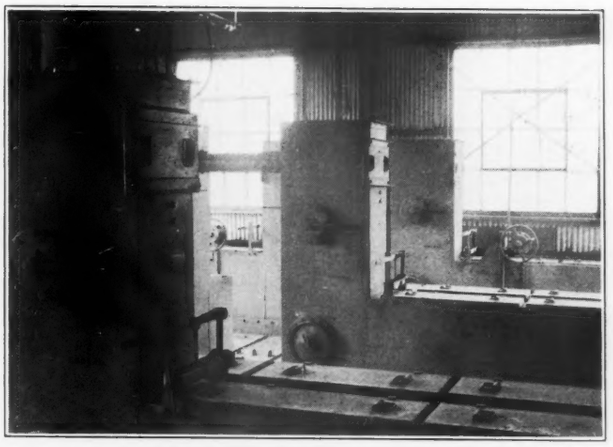
Nearly 200,000 bbl. of cement can be stored in the stock-houses and silos at the Security plant. Two of the stock-houses have a total of 30 wooden bins storing about 30,000 bbl. A third stock-house stores 42,500 bbl. of cement in six concrete bins. The balance of the storage capacity is provided by eight circular concrete silos with their three interstitial bins. The two tracks which serve the cinder and coal requirements to the mill pass directly between two groups of cement stock-houses. Therefore, the



A view in the modern power plant.

packing floors are located along two sides of the tracks and cars are loaded with bagged cement direct from packing machines. There are five Bates 4-tube packers in use, all served by steel supply bins. Nos. 1, 2, 3, and 5 deliver direct to 30-in. bag conveyors which transport the cement bags to the cars.

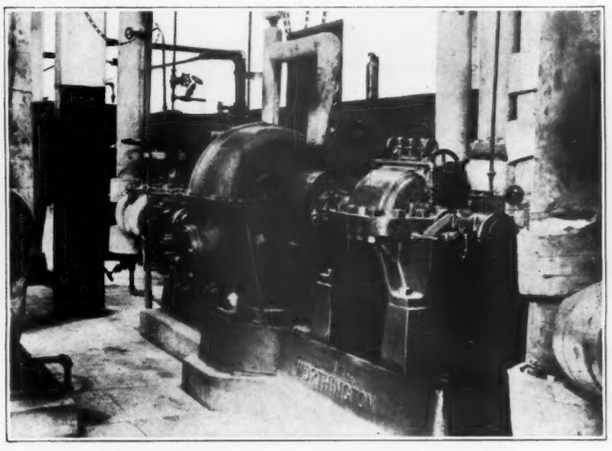
Returning to the mill to inspect the kiln-fuel supply and the waste-heat boiler plant, possibly the most interesting portion of the Security plant is discovered. This department, of course, will include the new power-plant as well as the stack-dust-precipitation equipment. Coal is received at the plant in car-load quantities on a trestle track and the cars are dumped into a 36-ton feed bin. The latter feeds



Upper section of the stack-dust precipitator.

a Buchanan 18-in. by 12-in. roll crusher. From this machine a 16-in. belt conveyor, 85 ft. long on centers, transports the crushed coal to a Cummer drier. This unit is 48 in. in diameter by 36 ft. long. It is set at a pitch of ¼ in. per ft. and is rotated at 6 r.p.m. From the drier the coal is elevated to a concrete bin which supplies the pulverizers. Three Fuller-Lehigh 42-in. fan-discharge mills pulverize the coal, these units being individually driven by 75-hp. vertical motors through belts. The pulverized coal is then handled by a series of screw conveyors and elevators to five steel 18-ton supply bins above the kilns. Fuller-Lehigh burners are installed on each kiln, the coal being fed to the burners by 6-in. feeders from each tank. Two Sturtevant No. 8 fans supply the necessary air for the burners.

In the coal mill there is also a 13-ton bin with a Fuller-Lehigh 4-in. pump. This equipment supplies



Turbine-driven centrifugal pump in power house.

pulverized fuel to the two stone-drier and the cinder-drier furnaces.

Since the installation of the new power-plant and waste-heat boilers in 1928, the Security plant has been achieving a remarkably low record in power cost. With 3 Edge-Moor water-tube boilers receiving the waste heat from 4 kilns, 2,500,000 lb. of water is evaporated during a 24-hr. period, making steam at 200 lb. pressure and 180 deg. superheat. This rate of evaporation is more than enough to

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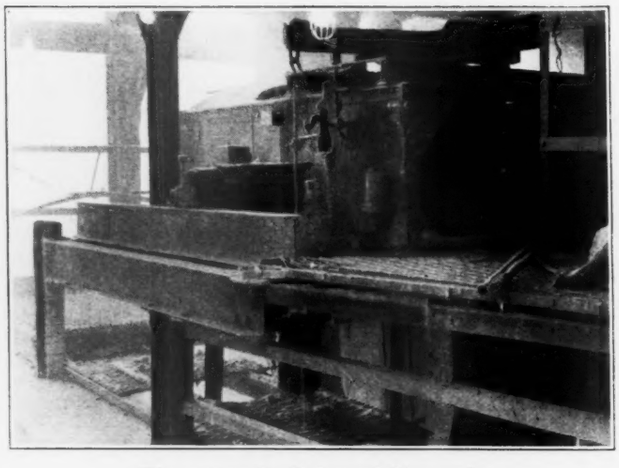
supply the two 3,000-kw. turbines in the power-plant at full load, and consequently it is necessary to valve off some steam. The three boilers have a rating of 1,006 hp. each with 10,060 sq. ft. of heating surface. There are two steam drums per boiler and each unit is equipped with a Foster superheater and a Foster economizer. The economizers are of the horizontal type, carrying 16 rows of tubes in height and 8 rows of tubes in width, with a total heating surface of 4,390 sq. ft. The temperature of the gases entering the boilers varies from 1,600 to 1,800 deg.; upon entering the precipitation chambers it has dropped to 385 deg. Three Green No. 9 induced-draft fans withdraw the gases from the boilers, sending them to the precipitation chambers and thence to the stack. These fans have a rated capacity of 108,800 cu. ft. of gases per hr. at 380 deg. They are of the double-inlet, three-quarter up-draft type.

With the new waste-heat-boiler plant, a new stack was erected, built and designed by the Heine Chimney Co. The stack is 262 ft. high, 22 ft. in diameter at the bottom and 15 ft. in diameter at the top. It is of reinforced-concrete construction.

The new power-plant occupies a building adjacent to the raw-and finish-grinding building. In design and construction, the building is typical of its type, with a broad, roomy generator floor surrounded by walls of steel and glass. Its principal equipment consists of two General Electric steam-turbine-and-generator units, each rated at 3,750 kva., which, at an 80 per cent. power-factor, becomes 3,000 kw. The turbines, which are the Curtis type, have 12 stages and are operated at 3,600 r.p.m. under automatic speed control. Beneath each turbine-generator unit on the level below is located a Worthington 5,000 sq. ft. surface condenser. A Whiting 20-ton electric crane spans the generator floor.

Water for the waste-heat plant is drawn from the neighboring Antietam Creek through a revolving screen which removes trash. Two 16-in. centrifugal pumps at the creek send the water to the plant, that which enters the power-plant system bring evaporated in Griscom-Russell, Riley-type, submerged evaporators. Thus, only distilled water enters the boilers. Recent inspection of the boiler tubes after 3 years' service reveals them in perfect condition.



The automatic clinker-weighing scale.

E. S. Guth, Southern district manager, and Paul Leichel, assistant superintendent.

On the generator floor in the power-plant, a complete central power-distribution board is located. This distributes power at 2,300 v. to the various departments and contains the main-line circuit-breakers as well as recording meters, volt meters, frequency meters, ammeters and the like. In a separate room off the generator floor, transformers, for the conversion of 2,300-v. power to 440 v. for some of the departments, are located. Here the incoming lines from the power company, used to supply power in the event the power-plant is disabled, are received. Under normal conditions, some power, excess over and above the cement mill's requirements, is sold to the utilities.

As stated, the latest improvement of any consequence is the stack-dust precipitator. The installation consists of two Cottrell rod-and-curtain type units installed in a separate building adjacent to the stack and the waste-heat-boiler plant. These units contain three sections, each of which has 18 ducts.

In operation, the precipitator succeeds in eliminating 95 per cent. of the stack dust which is reclaimed from the chambers at the rate of 60 to 80 tons per day. This material, along with dust reclaimed from the breeching of the boilers and dust withdrawn from equipment in the stone-drying and stone-grinding departments, is returned to one of the dry-stone storage bins for reclamation.

General Electric Co. motors, control apparatus and power-distribution equipment are standard in all departments of the plant. Conveying equipment, such as elevators, troughing rolls, idlers and the like, were furnished by both the Link-Belt Co. and the Robins Conveying Belt Co.

Plans are under way for the construction of a bulk-loading and bulk-storage plant at Washington, D. C. Facilities provided through the new Washington plant will enable the company to offer a wider scope of service to its trade in that city.

Portland Cement and Salt Most Valuable of Kansas' Nonmetallic Minerals

Sand and Gravel, Stone and Gypsum Next in Order; Undeveloped Resources Great

By KENNETH K. LANDES
Assistant State Geologist, Kansas Geological Survey

KANSAS has long been noted for the value of its agricultural products and, in more recent years, has become famous for the oil and natural gas found in deeply-buried rocks. But a relatively small number of people realize that the state has a third natural resource of importance in certain nonmetallic rocks and minerals that lie immediately beneath the surface. The annual value of the products in this last group lies between 17 and 18 million dollars and constitutes about 15 per cent. of the state's total yield from quarries, mines and wells. Furthermore, the known reserves for most of the nonmetallic minerals discussed in this paper are so large that the production to date has been insignificant compared with the potential production. When the deposits of lead and zinc and coal are noticeably depleted and the production of petroleum and natural gas has declined to a figure much less than that of to-day, Kansas will still be producing ample quantities of Portland cement, salt, crushed stone, and other nonmetallic minerals.

Of the nonmetallic-mineral products considered in this paper Portland cement is outstanding in terms of annual production value. Table I, giving data obtained by United States Bureau of Mines in cooperation with the Kansas Geological Survey shows the latest available production statistics. In addition there are a few miscellaneous nonmetallic minerals, such as natural cement and agricultural limestone, which do not appear in the statistical table, but which are produced in small amounts in Kansas and will be briefly discussed. Mention will also be made of nonmetallic-mineral resources which are as yet undeveloped.

TABLE I. NONMETALLIC-MINERAL PRODUCTION IN KANSAS

Year	Product	Quantity	Value
1928	Cement (Portland)	6,787,568 barrels	$10,091,330
1929	Salt	840,370 short tons	3,761,984
1928	Sand and gravel	2,760,277 short tons	1,532,399
1929	Stone	1,419,890 short tons	1,461,146
1928	Gypsum	126,227 short tons	935,595
1929	Volcanic ash	49,768 short tons	195,784
1928	Chats	99,000 short tons	19,000

General Geology.—The generalized distribution of the outcropping rocks of Kansas is shown in Fig. 1. The oldest rocks to appear at the surface, the Mississippian, are found only in the southeastern corner of the state. As one progresses westerly and northwesterly from this corner successively younger formations are encountered. This sequence of outcrops is due both to a general westerly dip of the rocks in eastern Kansas and to a gradual increase in elevation between the eastern and western borders of the state. The Mississippian rocks con-

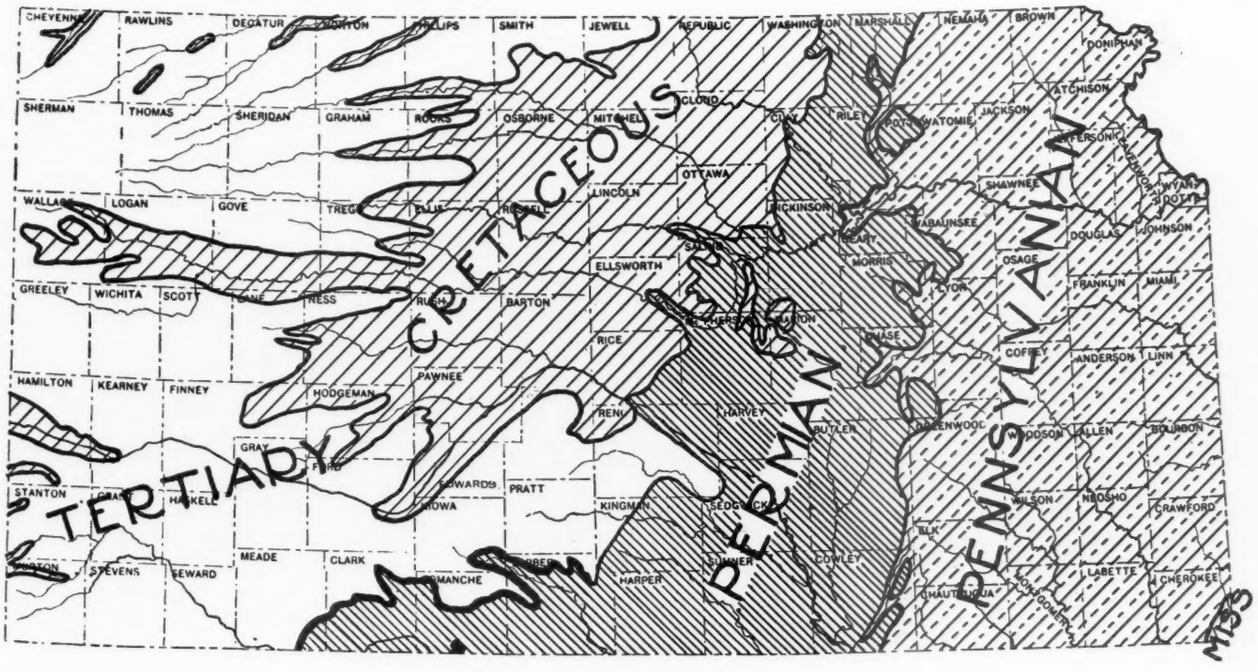


Fig. 1—Geologic map of Kansas.

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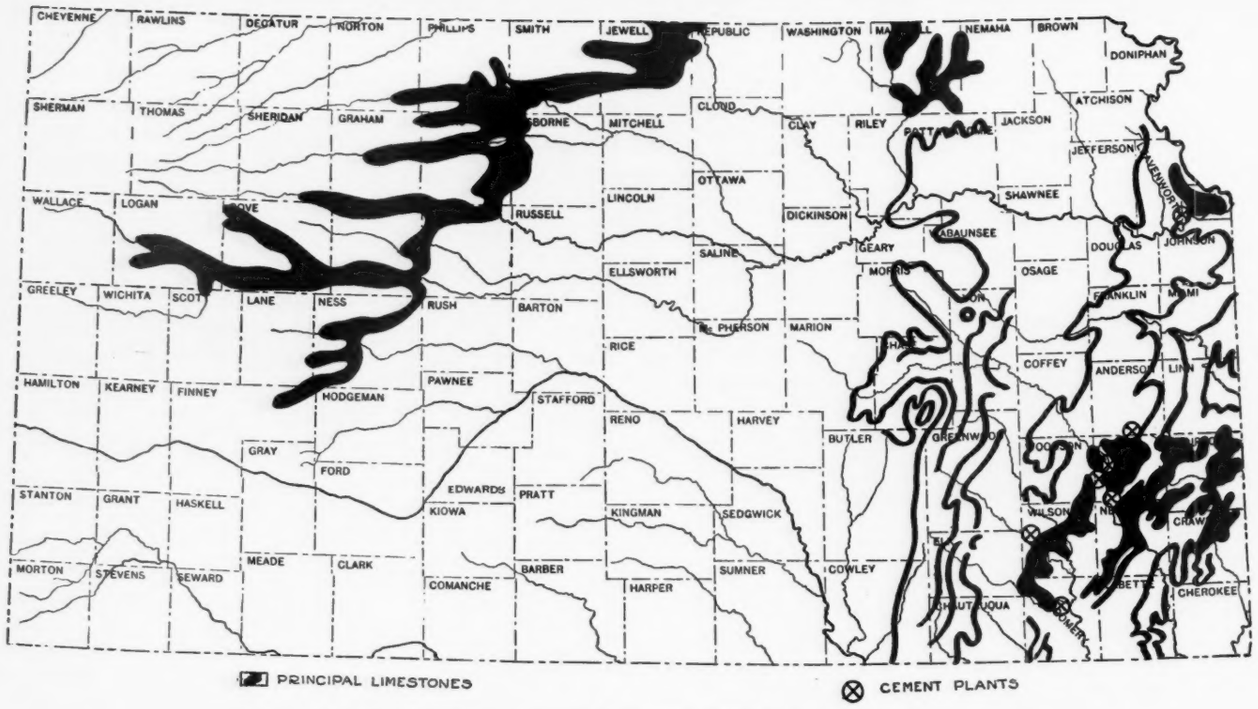

Fig. 2—Map showing Kansas cement plants and distribution of principal limestones.

sist mainly of cherty limestones, which contain, in southeastern Kansas and contiguous portions of Oklahoma and Missouri, rich veins of zinc and lead minerals. The chert gangue which is mined with these minerals is crushed and separated from the ore minerals during the milling process and is marketed under the name *chats*.

The Pennsylvania rocks consist of alternating beds of shale and limestone, the former of greater quantitative importance, but the latter of greater economic importance. All the source rock for cement and lime and much of the crushed stone produced in Kansas comes from strata of Pennsylvania age.

The next higher and younger group of formation is the Permian, which outcrops in a belt crossing the center of the state from north to south, widening materially near the southern boundary. The lower part of the Permian is very similar to the Pennsylvanian in its lithology. The upper part, however, was deposited in evaporating seas under desert conditions and contains huge deposits of salt and gypsum. The Permian sediments in the southwestern area of Permian outcrop in Kansas are predominantly red, and hence are known as *red beds*.

Cretaceous rocks outcrop between central Kansas and the western part of the state and have a large stratigraphic thickness. The lowermost Cretaceous rocks are shales and sandstones, and the uppermost are predominantly shale. Between these two extremes lies a very thick series of rocks consisting of chalks, chalky limestones, chalky shales, and shales.

Fresh-water sands, grits, marls and limestones of Tertiary age cover most of the surface of western Kansas and overlap the Permian in southern Kansas. Quaternary stream gravels and sands and volcanic-ash deposits, not shown on the geologic map, overlie portions of the Tertiary and older formations in central and western Kansas. One of the great continental glaciers extended into the northeastern corner of the state during the Pleistocene period and covered most of the surface of that area with drift, sand, and gravel. Lastly, the present-day rivers have deposited and are depositing sediment, much of it sufficiently coarse to constitute commercially-valuable sand-and-gravel deposits.

THIS is the first of a series of articles dealing with the nonmetallic-mineral resources of the different states. Each has been prepared by a recognized authority intimately familiar with the problems peculiar to the state of which he writes and each will contain geological and industrial information of great interest and value to nonmetallic-mineral producers. Succeeding articles in the series will appear at short intervals. The next will describe conditions in North Dakota.

Developed Resources

We shall first consider those nonmetallic minerals (other than mineral fuels and ceramic materials) which have been or are being exploited in Kansas. They will be discussed in the order of their 1928 production value.

Portland Cement.—All the Portland cement manufactured in Kansas is made from a limestone-shale mix. Many of the limestones contain a sufficient amount of shale, either disseminated through the rock or present in partings and thin beds, so as to approach a natural cement in composition, and therefore require only one part of shale to five or

six or even more parts of limestone to make the specifications for Portland cement. There is an almost unlimited quantity of limestone and shale sufficiently free from magnesia for cement-making purposes in Kansas. Due to their location in eastern Kansas, the limestones and shales belonging to the Pennsylvanian are most extensively used. Some of the Cretaceous limestones are also sufficiently pure for use in cement manufacture, but up to the present only little use has been made of this series of rocks. The distribution of the principal limestones in Kansas is shown in Fig. 2. The many lines in the east represent outcrops of Pennsylvanian and Permian limestones. The heavy black line in western Kansas is the outcrop of the Niobrara (Cretaceous) limestone formation. Shale is an invariable associate of the limestones of Kansas, so the cement manufacturer finds his raw materials

Fig. 3—Limestone quarry at a Kansas cement plant.

close together. Very often, in fact, both the limestone and the shale are obtained from the same quarry.

Seven Portland-cement plants are operating in Kansas. Their location is likewise shown in Fig. 2. One plant is located at Bonner Springs, close to the industrial district formed by the two Kansas Cities. The remaining six plants are located in southeastern Kansas, attracted there by a combination of excellent raw material and near fuel supplies, both natural gas and coal. The towns at which these six plants are located are Mildred, Iola, Humboldt, Chanute, Fredonia and Independence. A view in one of the state's cement quarries is shown in Fig. 3.

Due to the hardness of the limestones used in Kansas, drilling and blasting must be resorted to in the quarries. The blasted fragments are then loaded by steam or electric shovel into dump cars which are hauled by locomotive to the mill. In the mill the standard practices of crushing, mixing, and burning in rotary kilns are employed. Most of the plants use the wet process, but in at least one (Humboldt) the materials are mixed and charged dry. Shipment is made by freight car and by truck.

Some of the Kansas cement plants have followed recent trends in the industry and are making specialized products, such as quick-hardening and oil-well cements.

The production of Portland cement in Kansas rose rapidly from a value of $5,613,609 in 1916 to $10,868,590 seven years later. However, since 1923 production has been fairly stable, the value generally being between 10 and 11 million dollars annually. Slightly over one-half of the Portland cement produced in Kansas is used within the state. The remainder is marketed in adjoining states that are less fortunately situated in regard to raw materials and fuel. At the present time none of the Kansas plants are running at full capacity. Unfortunately for the cement industry the state road-building program is limited by law to the construction of 100 miles of concrete pavement annually.

Salt.—The amount of salt which is known to lie beneath the surface in Kansas reaches the incomprehensible figure of 5,000,000 tons. This amount of salt built into a prism 5 mi. square would extend upward to a height of 23 mi. or nearly four times higher than the tallest mountain peak. Or, if we were to mine the salt from its present position under a portion of the state and spread it evenly over the entire surface of Kansas, it would everywhere cover the ground to a depth of about 37 ft. Yet another way to dispose of this salt would be to build a wall 2 mi. wide and 1,000 ft. high entirely around the state.[1] Kansas alone has enough salt to last the country over a half-million years at the present rate of consumption.

Furthermore, the salt deposits of Kansas represent but a portion of a gigantic salt field which extends into southern and central Kansas from Oklahoma, Texas, and eastern New Mexico. This is the largest salt deposit in the country, if not of the world. The thickness of the salt beds in Kansas varies from nothing up to over 300 ft. Fig. 4 is an isopachus map showing the distribution and thickness of the salt beneath the surface. Due to

[1] Bass, N. W., *The Kansas Salt Beds:* Kans. Geol. Survey, Bull. 11, p. 93.

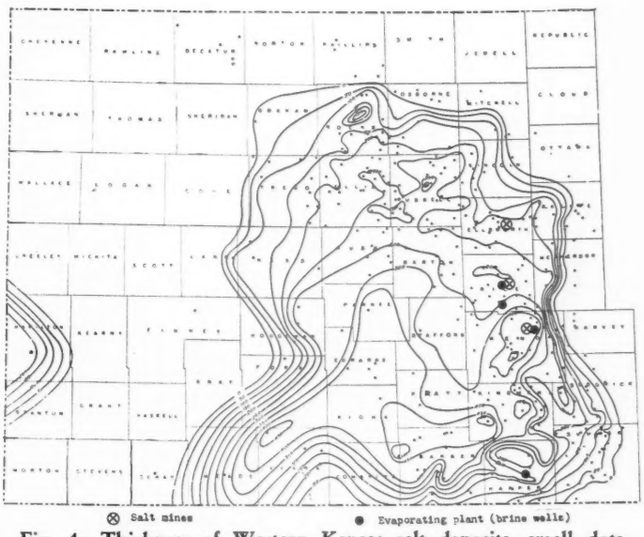

Fig. 4—Thickness of Western Kansas salt deposits, small dots indicating wells. Salt mines and evaporating plants also shown.

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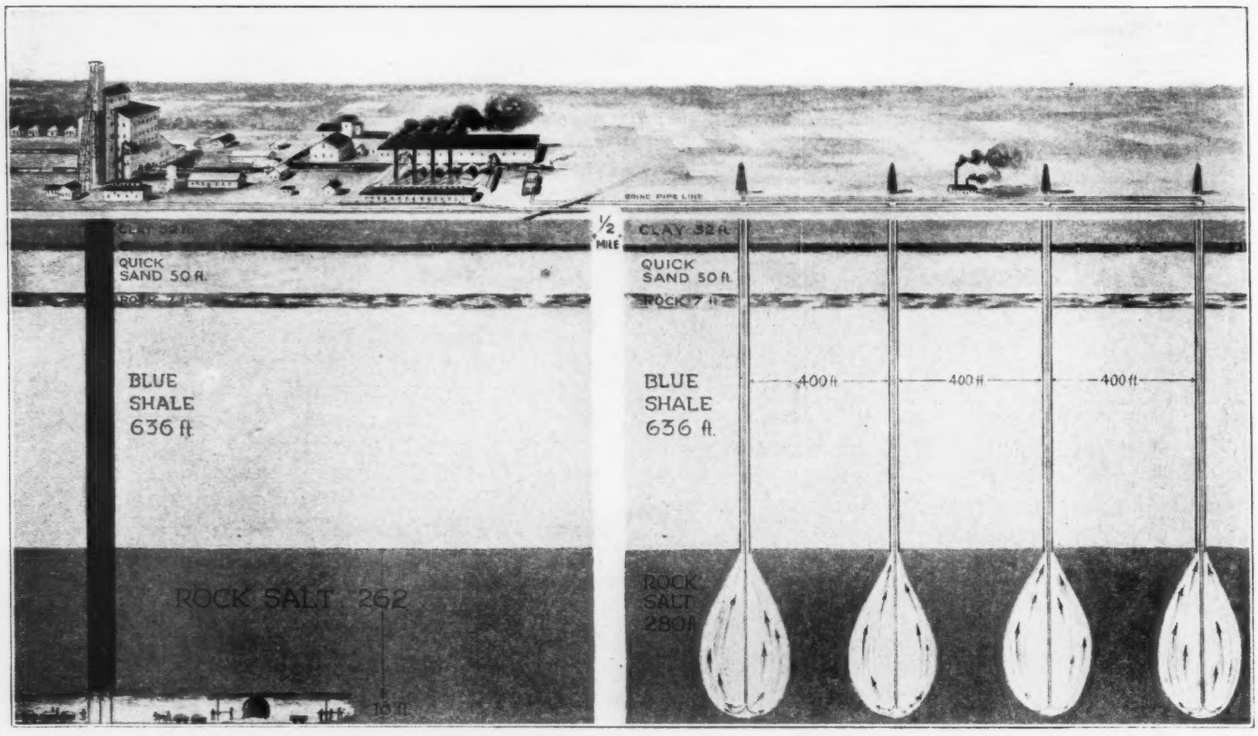

Fig. 5—Two methods of mining salt at Lyons, Kan. *(Photo courtesy American Salt & Coal Co.)*

high solubility, beds of rock salt do not crop out at the surface, but they are readily picked up by wells or mines a few miles west of where the associated strata crop out.

The salt beds of Kansas are confined to the Permian rocks. Evidently in Permian time an arm of the ocean extended northward from the Gulf of Mexico and covered a part of the interior of the United States which is now several hundred feet above the sea. This great body of water became separated from the main ocean and the water evaporated. However, as it takes about 100 ft. of seawater to make 3 ft. of salt, a body of water 10,000 ft. deep would be necessary to produce a 300-ft. deposit of salt. However, it is not conceivable that this inland sea was that deep at any one time, so we must conclude that upon a number of occasions, while evaporation was going on, additional salt water flowed across the barrier separating the inland sea from the open ocean, thus bringing in more salt. The deepest part of the basin, and consequently the area in which the very last water evaporated, was along the Texas-New Mexico line. It is here that the most soluble salts present in sea water, such as very valuable compounds of potash, were precipitated. No potash other than traces has ever been detected in the Kansas salt.

Kansas salt is mined in two ways, by brine wells and by ordinary mining underground. In the well method, however, the salt obtained is the same rock salt as that obtained in underground mining (Fig. 5), thus differing from much of the salt production in the eastern states where natural brines are exploited. In Kansas water is pumped down the inner casing of a well which penetrates the salt deposit. The salt is allowed to dissolve, and the saturated brine is brought to the surface between the inner and outer casings. The evaporating processes are the same for artificial brines as for natural brines. The brine wells have an advantage over underground mining in that only the soluble material is removed, while the shale partings and other insoluble materials are left behind. This proves to be a disadvantage, however, if there are beds of gypsum associated with the salt, for this substance is likewise soluble.

The distribution of evaporating plants (brine wells) is shown in Fig. 4. These plants are located in the towns of Anthony, Hutchinson, Lyons and Sterling. It is to be noted that they are near the eastern margin of the salt deposit, whereas the enormous reserves to the westward are entirely untapped. This distribution is due to two things: First, the shallower depth to the salt in the eastern area, and, secondly, the closer position with respect to market. In evaporating the salt open pans or drainers and vacuum pans are used. Salt blocks are also made from the evaporated salt.

Where underground mining is employed the salt is removed in much the same manner as coal. At one of the Kanopolis mines in Ellsworth County the salt is reached by shaft at a depth of 860 ft. The salt bed is 10 ft. thick and very regular and pure, though there are a few thin shale partings. Electricity is used for drilling, hauling and hoisting. One other mine at Kanopolis exploits the same bed. Upon reaching the surface the salt is crushed to different sizes. The coarser is sold crude and the finer converted into blocks. Rock salt is also mined at Hutchinson and at Lyons (2 mines). Fig. 5 illustrates two methods of mining salt and Fig. 6 shows underground operations in a Kansas salt mine.

TABLE II. PRODUCTION OF SALT IN KANSAS IN 1929

Method	Quantity (*short tons*)	Value
Evaporated:		
Open pans	81,400	$554,878
Vacuum pans	151,820	1,079,505
Pressed blocks	73,520	647,660
Total evaporated	306,740	2,282,043
Rock Salt:		
Crude	509,780	1,275,180
Pressed blocks	23,850	204,761
Total rock salt	533,630	1,479,941
Grand total	840,370	3,761,984

Kansas ranks fourth among the salt-producing states of the United States. The output and value of the product in 1929 are shown in Table II.

Sand and Gravel.—Although not an outstanding state in sand-and-gravel production, Kansas produces annually about $1,500,000 worth of these materials. Kansas is less fortunate than some states in that none of its deposits can be described as almost unlimited in potential output. On the other hand, it does contain a large number of deposits scattered over the state which are sufficient at present and will be sufficient for some time to come to supply local demand.

The Kansas deposits of sand and gravel are of three main types: (1) Those of glacial origin, (2) those deposited by ancient rivers, and (3) those found in the beds of our modern streams. Only one of the four or five continental glaciers which covered a considerable part of North America during the Pleistocene period extended as far southwest as Kansas. This glacier did not extend far within the state, but covered only the northeastern portion. Rock debris brought into Kansas by this body of ice was left behind when the glacier receded. Streams fed by the melting ice transported and sorted this rock debris, and deposited sands and gravels in deltas which extended into temporary lakes. A deposit of glacial gravel of considerable importance occurs near Blue Rapids, Marshall County, Kan. This gravel is used in concrete, road building, and for filtering and roofing. Fig. 7 shows a typical gravel pit in Ottawa County.

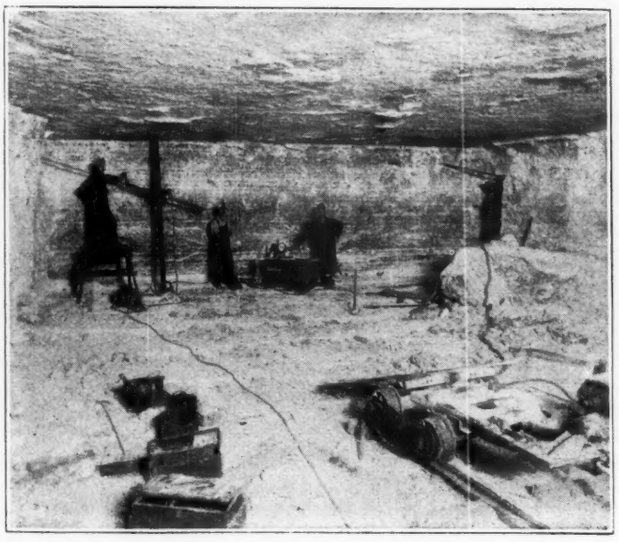

Fig. 6—Below ground in a Kansas salt mine.

Sand and gravel deposited by ancient rivers may be classified into three types according to the geological period at which time the deposition took place: (a) Tertiary, (b) Quaternary, (c) Recent. During the Tertiary age streams of large volume and considerable velocity ran eastward from the Rocky Mountains across the Great Plains and deposited in their shifting channels large amounts of sand and gravel. Such deposits are, as a general rule, rather poorly sorted, but they are exploited in a few places in Kansas for local road building and construction. During the Pleistocene period, at the same general time that ice covered the northeastern part of Kansas, other streams flowed eastward across the Great Plains and deposited sand and gravel. This material, which is also quarried locally, generally forms a thin, unconsolidated veneer overlying the Tertiary rocks. The ice in northeastern Kansas dammed some of the rivers in that area, causing them to follow temporary routes until the glacier receded. Along these temporary channels sand and gravel were deposited and are available to-day for exploitation. One such channel was in central Kansas where Smoky Hill River for

Fig. 7—Gravel pit showing character of deposit in Ottawa County. *(M. E. Wing photo.)*

a time flowed southward from Lindsborg and joined Arkansas River near Wichita, and left behind, when it returned to its former route down Kansas River, an area of considerable length and width filled with silt, sand and fine gravel, to depths greater than 100 ft. in places.

In the geologically-recent past some of our modern streams occupied slightly different and higher channels in which sand and gravel were deposited. These are known as terrace deposits. Subsequent erosion by the rivers and tributaries may cause the removal of most of the terrace deposits so that to-day only remnants of the originally continuous sand-and-gravel beds remain. These isolated deposits are of extreme importance in local road surfacing.

Lastly are the deposits which are being made to-day on the bottoms of our present streams. The relatively quiet water downstream from a stretch of faster moving water invariably contains de-

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posited sediment. In the smaller streams this sediment may be too fine for commercial utilization, but in the larger streams, such as the Kansas and Arkansas Rivers and their main tributaries, sand deposits of extreme commercial importance are found. Fortunately for the operator and also for the economic welfare of the community, every flood

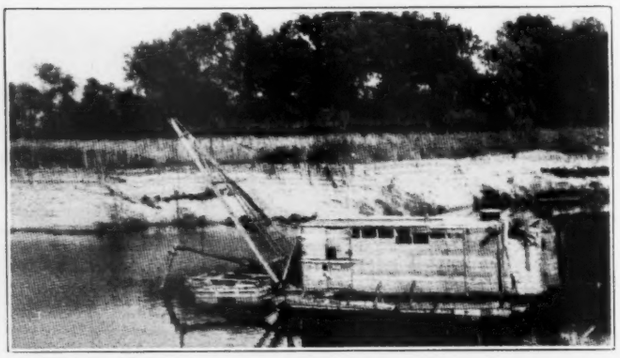

Fig. 8—Sand dredge operating in Cloud County. ***(M. E. Wing photo.)***

drops a load of fresh material which helps to replenish the supply.

The technology of sand-and-gravel production in Kansas depends, of course, upon the character of the deposit. Where the sand and gravel are above the water level in abandoned stream beds or glacial deltas, the usual surface methods are employed for stripping and loading the material. The sand-and-gravel deposits in the beds of the rivers are exploited by suction dredges (Fig. 8), ladder diggers and clam-shells. The sand is either loaded on dredges or carried ashore by pipe-line. Screening is employed in the case of both the dry and the wet sand and gravel.

Sand constitutes about two-thirds of the value of the sand and gravel produced in Kansas each year. Most of this sand is used either for structural purposes in concrete and mortar or in highway construction. In the latter case, some of the sand is used in concrete aggregates, but much more is used in sanding state and county roads for the purpose of obtaining an all-weather surface. A small amount of sand is used annually as engine sand, railroad ballast and molding sand. Between 85 and 90 per cent. of the gravel produced annually in Kansas, in terms of value, is used in paving concrete or for gravel surfacing. The remainder is used mostly in structural concrete and for railroad ballast. Table III gives the statistics of sand-and-gravel production in Kansas in 1929.

Stone.—Limestone with a value of $1,413,146 was quarried in Kansas in 1929. A small amount of sandstone, valued at $48,000, was produced during the same year. Limestone ranks next to shale in abundance among the Mississippian, Pennsylvanian and Permian rocks of Kansas. It is also present among the Cretaceous rocks of central and western Kansas. In fact, the only area of any size in which limestone is not abundant is in western Kansas where the sands and gravels of Tertiary age ob-

TABLE III. SAND-AND-GRAVEL PRODUCTION IN KANSAS, 1929

Kind of Material	Production (*short tons*)	Value f.o.b. shipping point
Sand:		
Structural (used in concrete and mortar, for buildings, bridges, culverts, etc.)	1,050,317	$608,983
Paving and road making (concrete and other)	991,381	538,691
Engine sand	63,070	35,113
Railroad ballast (sand)	23,976	13,005
Molding sand (including pig-bed sand, steel, brass, iron, cores, etc.)	15,016	10,371
Cutting and grinding sand and blast sand	5,546	2,902
Filter sand	1,472	1,976
Other sand	54,510	23,337
Total sand	2,205,288	$1,234,378
Gravel:		
Paving and road making (concrete and other)	914,149	556,002
Structural (used in concrete, for buildings, bridges, culverts, etc.)	108,965	56,783
Railroad ballast (gravel)	158,641	31,616
Other gravel	2,740	1,120
Total, Gravel	1,184,495	$645,521
Grand Total, Sand and Gravel	3,339,783	$1,879,899

scure the older formations which lie beneath. However, even the continental Tertiary rocks have at their top a thin algal limestone of fresh-water origin. The outcrops of the more important limestones are shown on the map printed in connection with cement (Fig. 2).

Sandstones are relatively rare in the Paleozoic rocks of Kansas, but some of the Cretaceous formations are sandy in part. The lowermost formation of the Cretaceous, known as the Dakota, is largely sandstone.

No recent data are at hand giving the location of stone quarries in Kansas. Almost every municipality of any size in central and eastern Kansas has a limestone quarry near. Most of these quarries were originally opened for the purpose of obtaining

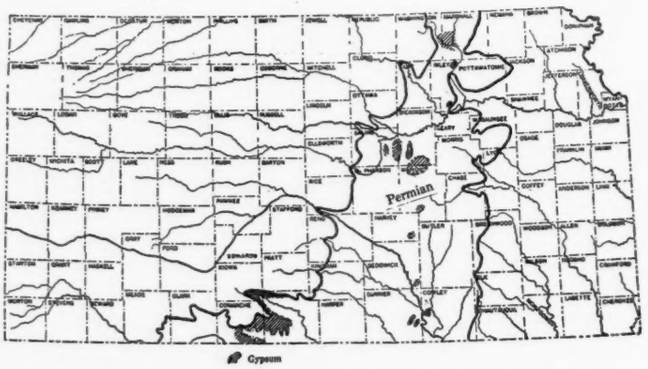

Fig. 9—Gypsum deposits in Kansas. ***(From Bull. 697, U. S. Geol. Surv.)***

dimension stone, but in recent years building-stone production has fallen off in Kansas so that now it amounts to but a few thousand dollars a year. However, some of these quarries have been reopened and are now being operated, generally rather intermittently, for the production of crushed stone. By no means all the limestones in Kansas are sufficiently hard to meet the Federal specifications for crushed stone to be used in concrete aggregate, so many of the abandoned building-stone quarries can not be reopened for crushed-stone purposes. On the other hand, a great number of new quarries have been opened along highways which were undergoing surfacing. More permanent crushed-

stone quarries are found in the vicinity of the larger cities of the state, especially in northeastern Kansas adjacent to the Kansas Cities. Some of these quarries are exploiting limestone beds 30, 40 and even 50 ft. thick.

Due to the hardness of the limestone ledges they form quite prominent escarpments and are generally overlain by a soil or clay cover of small thickness. In the smaller quarries the overburden is removed by scrapers, but shovels are employed in the larger stone quarries. The rock is drilled and blasted and loaded by hand or shovel into truck, wagon or dump car to be delivered to the plant. After crushing, delivery to the job is made by truck or railway car.

A quarry near Lincoln Center, Kan., is operating in a highly silicified phase of the Dakota sandstone, which is locally called quartzite. While not a true metamorphic rock as is the usual quartzite, this silicified sandstone is decidedly quartzitic in character. It is very tough and hard and is crushed for use in road building and in concrete mixtures. Elsewhere the Dakota sandstone is soft and friable and is of no value as crushed stone.

The thin algal limestone previously mentioned is utilized in a few localities in western Kansas for road surfacing. It is too thin to allow stripping of much overburden, but, occurring as it does in an area where hard rock ledges are scarce, it has commercial value.

By far the greatest amount of crushed stone produced in Kansas is used in concrete and for road materials. Railroad ballast is second in importance. Minor uses are for riprap and rubble.

Gypsum.—Workable deposits of gypsum are found in Kansas in rocks of Permian age (Fig. 9). Strata of this age appear at the surface in a broad band extending from the center of the southern boundary of the state to the Nebraska line in a direction slightly east of north. The gypsum-mining districts are located along this band. There have been three centers of production: southern, central, and northern, in Kansas. The two northern districts contain gypsum beds interstratified with limestones and shales. In the southern part of the state thick layers of gypsum are interbedded with red shales and sandstones (red beds). In this area the gypsum is higher stratigraphically and therefore younger than in the districts to the north. The northern or Blue Rapids district lies in Marshall County, a few miles south of the Nebraska line. Southwest of the town of Blue Rapids the United States Gypsum Co. is mining by underground workings a bed of gypsum averaging 7 ft. in thickness. A calcining plant operated by this company at Blue Rapids converts the gypsum into plaster. The Certain-Teed Products Corp. also operates a mine and plant at Blue Rapids. Products marketed by this company are raw gypsum, finishing, casting, molding and dental plasters, wall-board, and Keene's cement.

The central, or Gypsum City district, lies in Dickinson and Saline Counties. There are two well-marked horizons of gypsum in this area, with some indication of a third and lower horizon in the southern part. The upper and thinner of the well-marked horizons has been quarried at Hope, where the gypsum bed is about 5 ft. thick. The lower horizon, containing 14 ft. of gypsum in places, was penetrated by an 80-ft. shaft a quarter of a mile west of the Hope quarry. This bed has also been mined near Solomon, twenty miles northwest of Hope. The central district has had no regularly operated plant for a number of years.

The southern, or Medicine Lodge district, is located in Barber and Comanche Counties. It is the

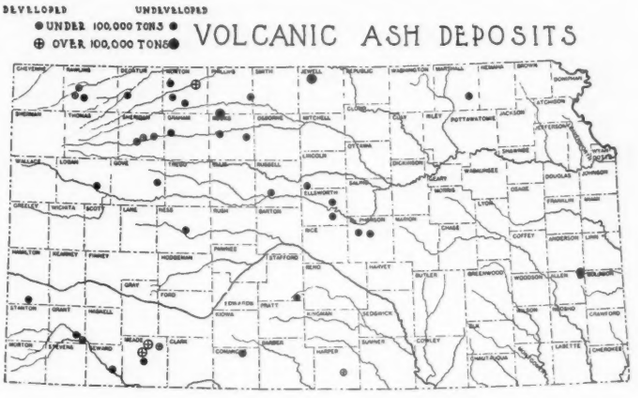

Fig. 10—Volcanic-ash deposits of Kansas.

largest of the Kansas districts and, with its continuation into Oklahoma and Texas, forms the largest area of gypsum in the United States. The principal gypsum bed of this district, known as the Medicine Lodge, is massive, with the lower portion very compact. It forms the cap rock for the gypsum hills which lie to the west of Medicine Lodge. Underlying red sandstones and shales crop out along the flanks of the hills. The gypsum layer varies in thickness from 3 to 20 ft., depending upon the amount of erosion. Elsewhere in the region a bed of gypsum 15 ft. in thickness appears above a red shale of equal thickness which overlies the Medicine Lodge bed.

The Best Brothers Keene's Cement Co. operates an open-cut mine at Sun City, in northwestern Barber County. The gypsum ledge caps the hills on the south side of the Medicine Lodge River valley. It is 16 ft. thick and is covered by a small overburden. The gypsum is drilled and blasted on the quarry floor, whence it is transported by dump car to a small crushing plant lying at the north edge of the quarry. After the primary crushing the gypsum is carried to the railroad, which runs along the valley bottom, by means of an aërial tramway. Railway cars carry the gypsum from the Sun City siding to the company's plant at Medicine Lodge. Here the material is calcined in large rotating kilns and converted into Keene's cement. There are three of these kilns, each having a diameter of 8 ft. and a length of 125 ft. Plaster of Paris is also manufactured at this plant.

Kansas was the eighth state in gypsum production in 1928 with a total yield of 126,227 tons valued at $935,595. The greater part of the gypsum mined was sold calcined.

Volcanic Ash.—Although Kansas has no vol-

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canoes and has never had any volcanoes as far as the geological record shows, the state does contain some large deposits of volcanic ash and is the leading producer of this important abrasive. In 1929 nearly 50,000 tons of volcanic ash was produced, valued at $195,784. The presence of volcanic ash within the borders of Kansas is explained by the fact that, because of its lightness, it can be carried by wind for many miles. During one of the interglacial periods, when volcanoes to the west of Kansas were active, the fine ash blown into the air was carried over western Oklahoma, Kansas, and Nebraska by the prevailing westerly wind. The source volcanoes were probably those of the Capulin group in northeastern New Mexico.

There were two stages involved in the deposition of the ash. In the first stage this volcanic material settled out of the air on the earth's surface and formed a very thin blanket over it as though a light snowfall had visited the region. Modern volcanoes, such as Katmai in Alaska, have covered the surrounding region with ash in a similar manner. Following this preliminary step the wind drove the ash along the ground in drifts and dunes. Some of the drifts came to rest on the leeward side of ridges or in some other protected spot and consequently have been preserved. Other drifts were blown into stream valleys and were destroyed by the erosive action of running water. The largest deposits which were preserved are found near the 100th meridian. In Kansas deposits of a million tons or more have been discovered in Meade, Norton, Phillips and Jewell Counties. The location of these and smaller deposits may be noted on the accompanying map (Fig. 10). The thickness of

Fig. 11—Volcanic-ash bed in Grant County.

the individual ash beds varies from a few inches to 30 ft. and the area from a few square feet to 160 acres.

During 1928 five companies operated seven deposits located in Comanche, Grant, Meade, Norton and Sheridan Counties. An ash bed in Grant County is shown in Fig. 11. The overburden is first stripped off by means of scrapers, after which the ash can be shoveled directly into wagons and delivered to railway car or plant. Much of the ash produced is shipped crude and dried and screened at its destination. However, the Cudahy Packing Co. maintains a plant at its deposit in Meade County and the Pumicite Co. has erected temporary plants at deposits undergoing exploitation. Fig. 12 shows a common method of storage.

Volcanic ash is composed of exceedingly minute and very angular fragments of rock glass. Because of its hardness and very sharp edges it makes a splendid abrasive and is used in a large number of scouring soaps and powders. An important and growing use for this material is in concrete admixtures.

Chats.—The zinc and lead minerals mined in southeastern Kansas occur disseminated through very cherty Mississippian limestone. Consequently, the ore contains much more chert than sphalerite and galena, the principal zinc and lead minerals. In concentrating these minerals in preparation for smelting, the ore is crushed and the chert separated by jigging. Enormous piles of chert, marketed as chats, accumulate outside the zinc and lead concentrating plants.

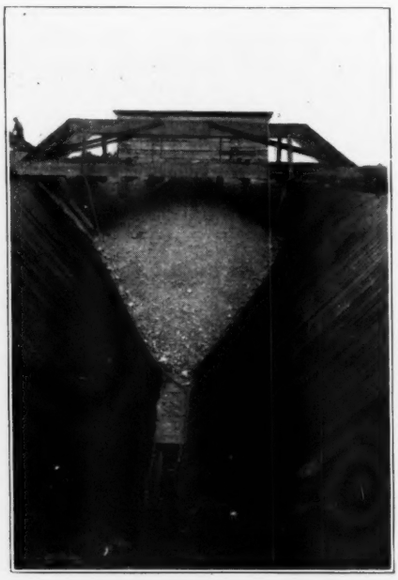

Fig. 12—Bin at pumicite plant at Anthony, Kan.

Chats make splendid road dressing and railroad ballast. All the main roads and many of the secondary roads within trucking distance of the zinc and lead mines are surfaced with this material, and some of the railroads have used it to ballast many miles of track.

Natural Cement.—The manufacture of natural cement was at one time a flourishing industry in Kansas, but one by one the plants changed to Portland cement so that now there is but a single natural-cement plant, which is located at Fort Scott. This plant quarries a thick bed of shaly limestone which overlies a thin bed of coal. The latter is mined and burned beneath the kilns, solving a part of the fuel problem. The Fort Scott plant also crushes limestone which is marketed for agricultural purposes.

Lime.—The United States Bureau of Mines lists two lime plants in Kansas, one in Bourbon County and the other in Cowley County, but neither plant reported any production in 1929. However, there is an abundant supply of limestone available for calcining within the state.

Undeveloped Resources

Chalk.—Kansas has one of the great deposits of the country, but so far no attempt has been made to exploit this material. The broad band of lime-

stone outcrop in western Kansas, shown in Fig. 2, which extends from the Nebraska line across Jewell County southwest to northeastern Finney County, is a chalky limestone, interbedded with chalky shale, known as the Niobrara. The long westward extension of this outcrop band into Logan County is caused by the deep erosion of Smoky Hill River. The chalk reserves up this river valley are almost unlimited. A cement plant at one time operated in Ellis County, using this Cretaceous limestone, but is now dismantled.

Bentonite.—Bentonite is common in the rocks of western Kansas, but in most cases the beds are but a very few inches thick and are covered by a chalky overburden of considerable depth. However, geologists of the Kansas Geological Survey have recently observed a bentonite bed several feet thick in Norton County in the northwestern part of the state and thick deposits of bentonitic clay in Wallace County, near the western border of the state. These deposits may some day be of commercial value.

Diatomaceous Marl.—Wallace County has also been the scene of a recent discovery by M. K. Elias, of the Kansas Geological Survey, of a thick bed of diatomaceous marl. Roughly estimated, about one-half the volume of the rock consists of diatoms and the remaining half of calcium carbonate. It is soft and much less porous than ordinary diatomaceous earth, and consequently could not be used for the common purposes to which that material is put. On the other hand, the presence of calcium carbonate gives the product certain useful properties of its own, which may make it a mineral resource of value. Preliminary study of samples submitted to the Bureau of Standards produced the statement: "from the work up to date it would appear that this material can be burned so as to produce a lime having hydraulic properties."[2] At the present time a considerable amount of hydraulic lime is now imported annually from France. The Wallace County marl is almost identical chemically to the marl from which the French hydraulic lime is made.

Three deposits of diatomaceous marl in Wallace County were recently described in a circular of the Kansas Geological Survey. The largest one of these has a total length of exposures, interrupted in places by loess, of slightly more than three miles. The thickness of the bed ranges from 2 ft. up to 11 ft., and the average is about 7 ft. The overburden above the marl consists of thin, hard limestone and in some places of grit slightly cemented by calcium carbonate. Elias, in a very rough estimate, calculates that this one deposit contains at least a million tons of diatomaceous marl underlying an overburden not exceeding 30 ft. in thickness.

[2] Letter of Bureau of Standards, Dec. 29, 1930.

Sales of Cut Limestone in Bedford District Drop Slightly

The total quantity and value of graphite sold by graphite miners in the United States in 1930 were considerably smaller than the corresponding figures for 1929, according to a statement by the U. S. Bureau of Mines, Department of Commerce. The sales of natural amorphous graphite by producers in 1930 were 1,941 tons, valued at $20,525. In comparison with 1929, there was a decrease of 1,641 tons, or 45 per cent. in quantity, and of $26,125, or 56 per cent. in value. Because only two operators reported sales of crystalline graphite in 1930, it is impossible to publish figures without disclosing confidential information. Statistics of sales of graphite were collected in coöperation with the Geological Surveys of Alabama and Michigan.

The states reporting the sale or use of graphite by the miner in 1930 were Alabama, Michigan, Nevada, and Rhode Island. Alabama was the only state reporting sales of crystalline graphite in 1930.

The foregoing figures represent the sales or shipments of graphite. The production figures are somewhat different. Only one amorphous graphite mine was in operation in 1930, that of the Carson Black Lead Co., in Nevada. Two other operators used or sold material from stock mined previously.

The imports of graphite in 1930 amounted to 16,726 short tons, valued at $531,642, in comparison with 24,072 short tons, valued at $1,066,834, in per cent. in quantity and of 50 per cent. in value 1929. The 1930 imports represent a decrease of 31 from the preceding year.

Home-Made Mixture Proves Efficient for Lubricating Open Gears

Operators of cranes, excavating and other machinery will find the following home-made mixture an especially efficient lubrication for open gears, according to G. H. Olson, manager crane and shovel division, Link-Belt Co., Chicago.

White lead	½ lb.
Cylinder oil	½ gal.
Flake graphite	½ lb.

"This mixture adheres well to the gears and it can be painted on with a brush, as required, at intervals of about five hours. The graphite and oil form the lubricating content of this mixture. The white lead acts as a binder, and keeps the gears from cutting," says Mr. Olson.

"Cup grease may be substituted for the cylinder oil. The graphite may be omitted, but it is not advisable to do so in warm weather. Some of the standard gear compounds may be used with good results, but they have a tendency to run off the gears and get in the frictions of excavating machinery, usually resulting in a dirty machine. However, most of these compounds may be obtained in grades that are suitable for use in various temperatures.

"The white lead mixture may be made heavier for warm weather by using less oil or grease in proportion to the quantity of flake graphite.

"Above all," Mr. Olson concludes, "keep all moving parts properly lubricated for increased life and efficiency."

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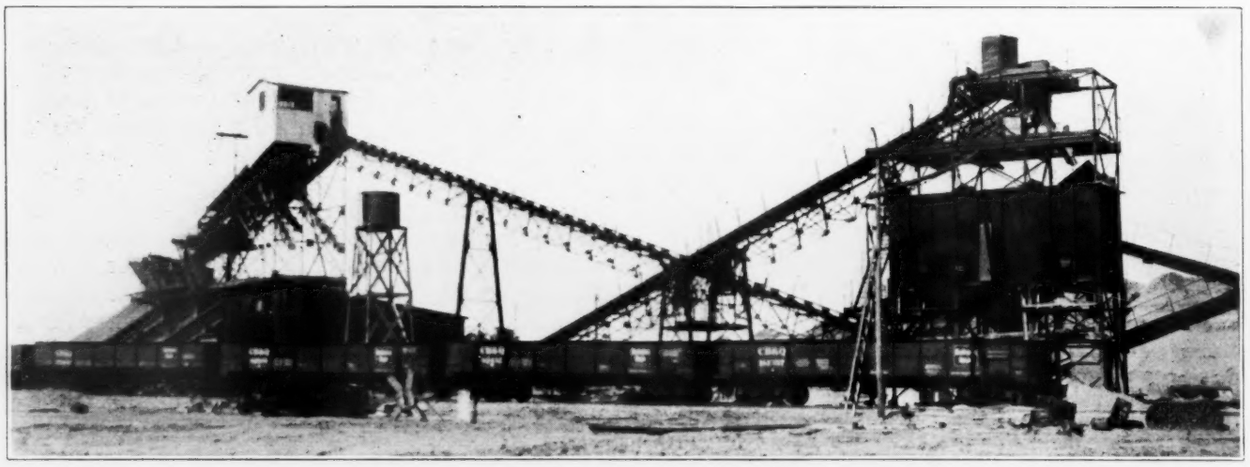


Plant view showing screening building and, at right, the loading bins.

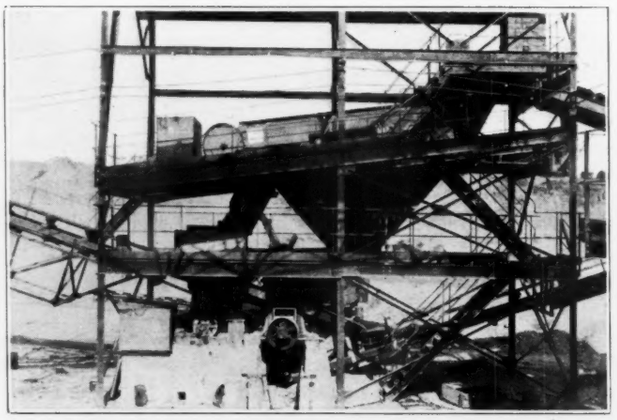
Handling Done Entirely by Conveyors in New Illinois Gravel Plant

Belts Carry Material from Pit, Through Plant and Load Sized Product Into Cars

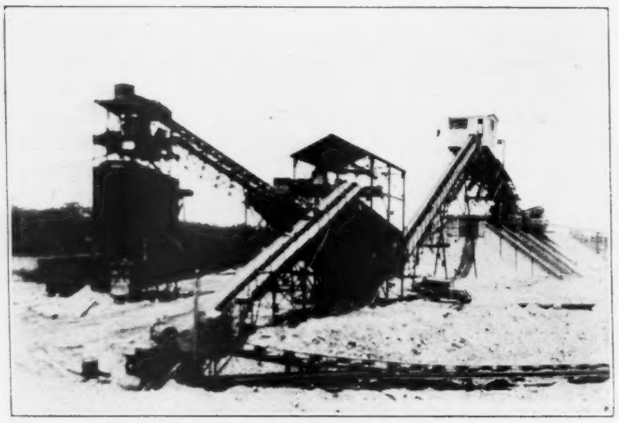
By W. E. TRAUFFER

THE new Sheridan Sand & Gravel Co. plant near Sheridan, Ill., must be classed as one of the outstanding developments of the year in the sand-and-gravel industry. No expense was spared to secure the best of equipment and the most permanent type of construction. The plant is entirely of steel and concrete construction and has a capacity of 250 tons per hr.

Among the features of this plant are: The use of field conveyors in the pit; the use of belt conveyors for all plant handling of materials; the thorough provisions for producing a cleanly-washed aggregate; the stock-piling and tunnel-conveyor loading system; and the generation of power for the plant. Five concrete and steel partitions support the framework of the screening plant and form the six storage piles which have a total capacity of 25,000 tons.



Scalping screen with the two gyratory crushers below.



Another view of the plant with field conveyor in foreground.

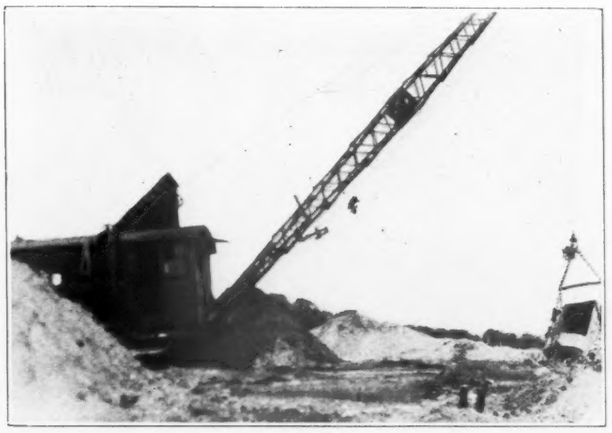
Construction of the plant was actually begun on Jan. 2, 1931, the first steel was erected on March 10, and the plant went into operation on April 20.

The plant is on a property of 78 acres located on the western outskirts of Sheridan and on the east side of the Fox River, on which it has a 1-mile frontage. The deposit is calculated to contain 15,000,000 tons of gravel averaging 55 per cent. over ½ in. in size. From 15 to 25 per cent. of this gravel is over 2 in. in size and requires crushing. The deposit averages from 50 to 80 ft. in depth and has an overburden of from 0 to 5 ft. in thickness.

An old plant had been operated on this property for 8 years until March, 1929, when it was pur-

chased by the present company. The plant was then operated for two years to prove out the deposit and the market for the product before construction of the new plant was begun.

Stripping of the overburden is being done by a Monighan semi-Diesel walking drag-line operating a 1½-cu.yd. Page bucket. At present the dirt is being piled back from the pit, but arrangements are to be made later to haul the stripping to the old pit 300 ft. distant. Trucks or belt conveyors will probably be used for this purpose. Five McCormick-Deering Steel Mule tractor-dump wagons with a capacity of 2 cu.yd. each will also be utilized. These were used during the construction of the plant.



The walking drag-line used for stripping.

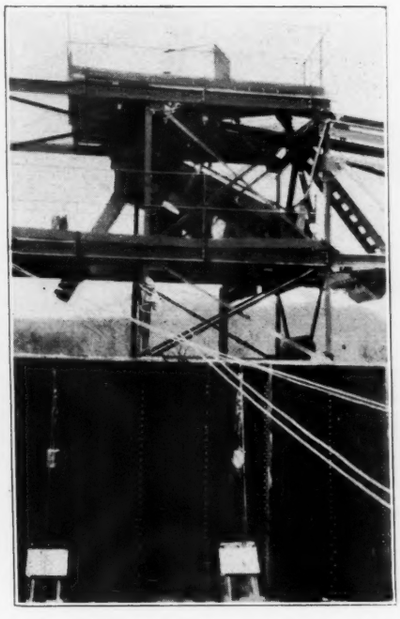
The screening plant with sand drags above storage piles.

The face of the pit is now only 30 ft. in height, but this will be increased to 60 ft. after the pit is worked farther into the deposit. Gravel is excavated by a Marion 450 gas-electric shovel with a 1¼-cu.yd. dipper which has been built up to a capacity of 1½ cu.yd. The shovel loads a 6-cu.yd. portable steel hopper mounted on skids and straddling the field conveyor. An 8-in. rail grizzly over the hopper rejects all stone too large for the crushers. The hopper discharges by means of a 30-in. cast-steel apron feeder to the 24-in. wide by 200-ft.-centers portable field conveyor. The feeder is driven by a 3-hp. Allis-Chalmers motor through a silent-chain and gear drive. The field conveyor is driven in the same manner by a 15-hp. motor.

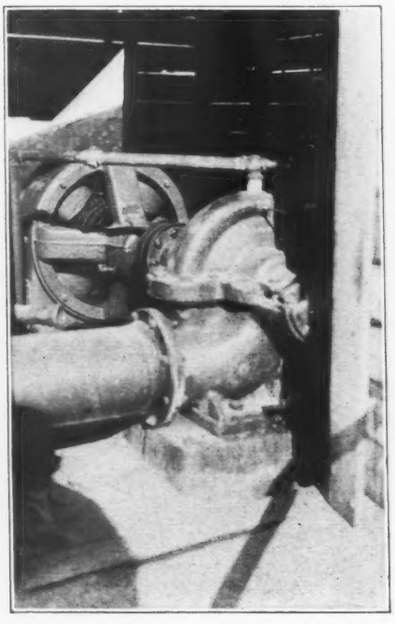
This installation is somewhat unusual and merits further explanation. The field conveyor is in 25-ft. sections consisting of two braced light channel sections. These are mounted on flat steel standards. This conveyor is moved on rollers of 2-in. pipe sections and requires from 30 min. to 1½ hr. for each shifting. The hopper, being of all-steel construction, is extremely heavy and is shifted by the shovel. An electric conduit fastened to the conveyor frame has outlets every 50 ft. These furnish current for the feeder motor regardless of the position of the hopper over the conveyor.

The discharge end of the field conveyor rests on a rail around the rim of a circular concrete turn-

Rollers used to facilitate shifting of field conveyor.



The washing screens over the loading bins.



The pump which supplies wash water to the plant.

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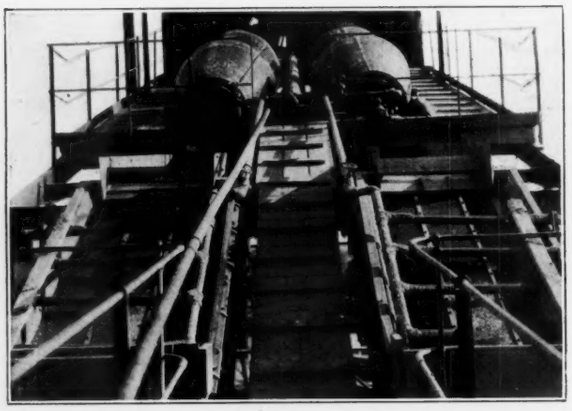
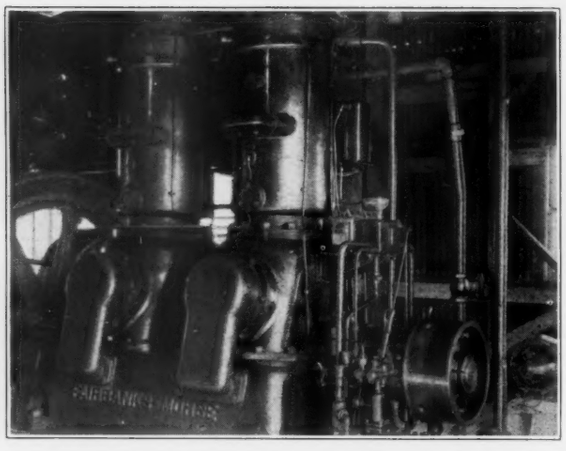


Left, reading down—The crushing building and at right, the loading-and-washing building. The 2-cylinder, semi-Diesel engine in the power house. General view of plant, drag-line stripping in foreground, crushing-and-loading building at left, screening-and-storage at right.

Above—Two sets of inclined conical screens with two vibrating screens for fine sizing in foreground.

In circle—Pivoted discharge of field conveyor to conveyor leading to the crushers.



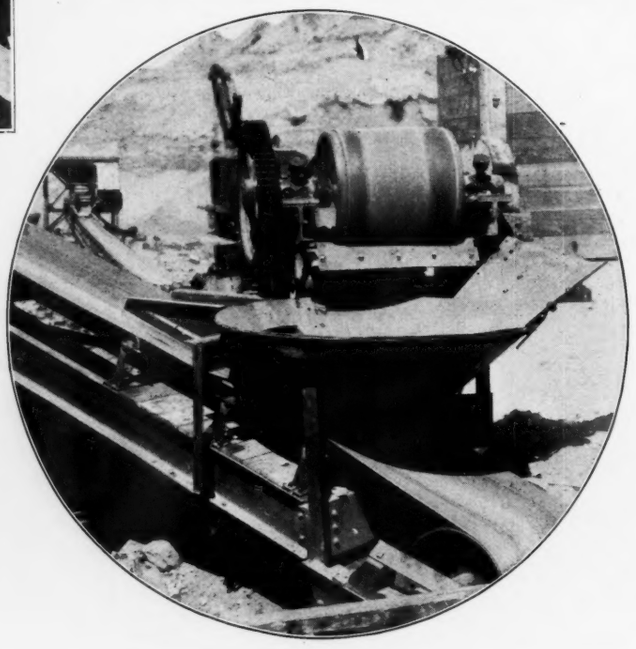
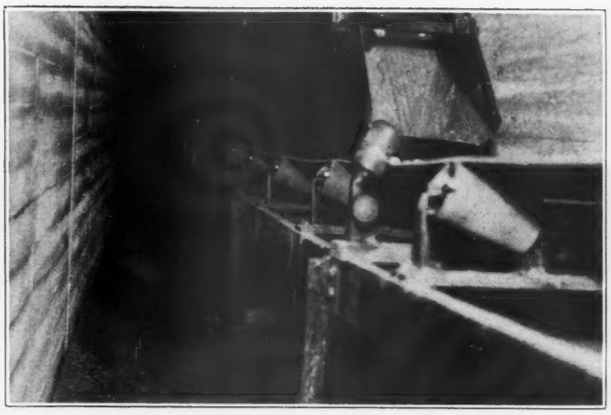
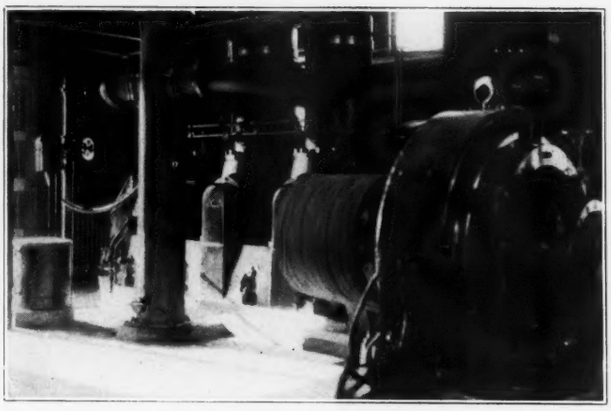


table about which the conveyor is swung as the shovel cuts into the bank. Although the conveyor is now only 200 ft. long it will later be extended to 600 ft. When this has worked out its circuit, another 300-ft. conveyor will be swung from its end in the same manner.

The field conveyor discharges into a circular steel hopper over the turntable on conveyor No. 1 which runs to the scalping and crusher building. This conveyor is 30 in. wide, is on 96-ft. centers and is driven at the rate of 235 ft. per min. by a 10-hp. motor. Conveyor No. 1 discharges through a stone-box chute into the Link-Belt 48-in. by 16-ft. revolving scalping screen. This has a 2-in.-square perforated plate and is driven through silent chain, chain and gear by a 15-hp. motor.



Tunnel conveyor and some of the gates under the storage.



The 3-cyl. Diesel engine with generator in foreground.

The over-2-in. material drops to an 8-in. Allis-Chalmers Superior McCully gyratory crusher. This is set to 2 in. and discharges to the inclined return conveyor (No. 2) which feeds the crushed material back to conveyor No. 1. The crusher is Texrope-driven by a 15-hp. motor. The return conveyor is 16 in. wide, is on 63-ft. centers, and is driven at the rate of 200 ft. per min. by a 3-hp. motor. An Austin No. 3 gyratory crusher from the old plant was installed alongside the other crusher so that it can be used as an auxiliary in case of a breakdown, or if the amount of stone to be crushed exceeds expectations.

The material passing through the 2-in. perforations of the scalping screen drops to conveyor No. 3 which carries it to the screening building. This conveyor is 24 in. wide and operates on 207-ft. centers. It is driven at the rate of 300 ft. per min. by a 30-hp. motor. An inclosed retarder on the driven shaft prevents reversal of the conveyor under load in case of power failure. This conveyor discharges the material through a split chute to two sets of three 31½-in. by 63-in. by 84-in. Link-Belt Dull-type inclined conical screens. Both sets of screens are driven by silent chain and gear from the same 20-hp. motor. These screens have round perforations, 1½-in., 1-in. and ½-in. in diameter. Each screen is fitted with a spray which washes the material as it is being screened.

The three sizes of gravel produced drop or are chuted directly to storage. The material passing through the ½-in. screens passes through a short flume to two 4-ft. by 8-ft. Link-Belt single-deck vibrating screens of the unbalanced type. These have ¼-in.-mesh wire cloth and each screen has 3 sprays for further washing. They are driven through 2-strand V-belt drives by 2-hp. motors.

The ¼-in. to ½-in. material retained on these screens drops directly to storage. That passing through the screens goes through a steel flume together with the waste water. A slotted plate in the bottom of this flume feeds the finer sand to the first of two 48-in. by 27-ft. Link-Belt sand drags. A rubber cover allows as much of this plate to be covered as desired to regulate the grading of the sand going to the drag. The material passing over the plate goes to the second drag for torpedo sand. The

The two sand drags and driving mechanism.

The field hopper and conveyor.

overflow from both drags goes through a wooden flume to an abandoned pit. This is dammed off by gravel from the pit from which the wash water is secured so only clean water will seep through. Each drag discharges directly to storage. The torpedo sand is stored in the last pile next the old pit so that any excess of this material slides into the pit.

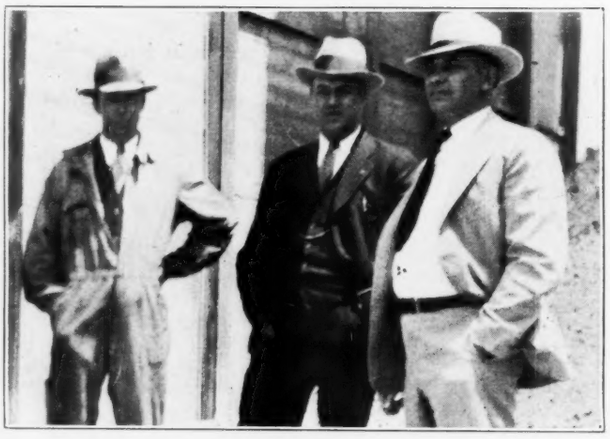
The sand drags are fitted with No. 830 Ley bushed chain and have manganese bushings and nickel-alloy pins. Each drag is driven by an individual 10-hp. motor.

The materials are recovered from the six storage piles through a 225-ft. concrete tunnel under them. Material is discharged through 14 gates (2 under each end bin and 3 under each of the others) to conveyor No. 4 which is known as the loading conveyor. By manipulation of these gates all seven classes of material specified by the state and county and any other desired grades can be produced. The tunnel is provided with electric lights. The loading-out conveyor is 24 in. wide and operates on 363-ft. centers. It is driven by a 25-hp. motor.

Outside the tunnel the conveyor inclines to the washing and loading building. This discharges into a split chute with a flopper gate so that when sand is being loaded it can be diverted directly into one of the three compartments in the 300-ton steel loading bin. Gravel is diverted to a Link-Belt 4-ft. by 8-ft. single-deck vibrating screen of the eccentric type which has sprays to give the gravel a final rinse. This screen has ¼-in.-mesh wire cloth and is driven by a 5-hp. motor through a Gilmer V-belt.

Any material passing through the screen goes through a pipe to a waste pile. That passing over the screen is discharged through a split chute to either of the remaining two 100-ton compartments of the bin. Each of the three compartments has a segmental drop-chute gate on each side, one for car-loading and the other for truck-loading. The loading capacity of the plant is 400 tons per hr.

The plant is connected by a 3,000-ft. siding to the Fox River Branch of the C. B. & Q. Ry. This connects with the C. R. I. & P. Ry. at Ottawa, the I. C. at La Salle, the Wabash at Streator and the E. J. & E. at Joliet, permitting economical distribution as far west as Galesburg and east to Chicago, north to Savanna and south to Jacksonville. Truck shipments are also made within a radius of 20 mi. The sidetrack has a grade of 1½ per cent. beyond the loading point to allow the "spotting" of cars by gravity. The track has a capacity of 40 empty and 40 loaded cars.



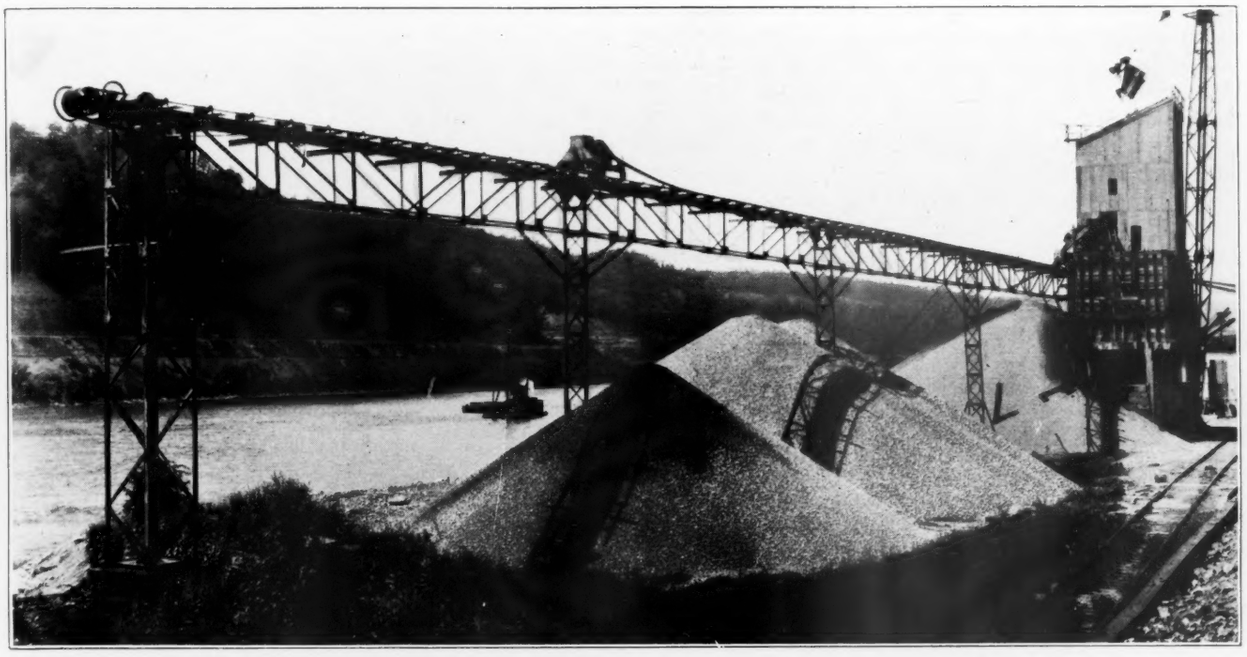
J. E. Rogers, supt.; H. B. Faith; and Ralph G. Near, sales mgr.

Gear and inclosed silent-chain drives of the conical sizing screens.

As previously stated, the plant generates all its own power, using 250-v. direct current. The powerhouse is located near the crusher building and is the only part of the plant not of all-steel construction. This building has concrete foundations and floor, timber structure, and corrugated-metal siding and roofing.

The main generating unit is a Fairbanks-Morse 3-cyl., 210-hp. Diesel engine, Model 32D Style VA,

(*Continued on page 45*)



Conveyor on gallery showing tripper and stock-piles below.

Cableway Spans Unnavigable Portion of River to Reclaim Aggregates

Material Dredged from Stream Dumped to Underwater Storage for Later Recovery

DESPITE the width of the Ohio River at Moundsville, W. Va., the Moundsville Sand Co. operates a slack-line cableway for the recovery of river aggregates. The cableway, however, does not span the river, which is 1,400 ft. wide at this point, but extends outward for a distance of 600 ft. where its tail anchor is sunk in the river bed. An installation such as this is rather unusual because the equipment in question is not often used in navigable streams. In this instance, the navigable channel of the Ohio River is nearer the Ohio shore than the West Virginia shore, therefore the cableway does not interfere with navigation.

In other respects, too, the Moundsville operations are of interest. Two plants are operated, one, the river plant already mentioned, and another, a pit deposit for the production of sand. The river operation is a representative medium-sized plant having a daily output of 1,000 tons. It is fortunately located at the very edge of the business district of Moundsville and yet within a half-mile of an extensive gravel bar in the river which serves as its chief source of supply.

Aggregates are won from the river bar by means of a clam-shell dredge which loads a scow. The latter, a self-dumping type, is towed to a position near the cableway and dumped. While the method resolves itself into a double handling of the materials, it affords the advantage of under-water stock-piling of a large supply of raw material available at any time. There is also a surge value in the method, the under-water supply being sufficient to offset any delays on the part of the dredge because of breakdown, changes in position, and the like.

The clam-shell bucket dredge has a 30-ft. by 70-ft. wood hull which is 4 ft. in height from deck to bottom. Its principal equipment consists of the steam power and hoisting machinery for the clam-

The dredge and tow-boat *Elaine*.

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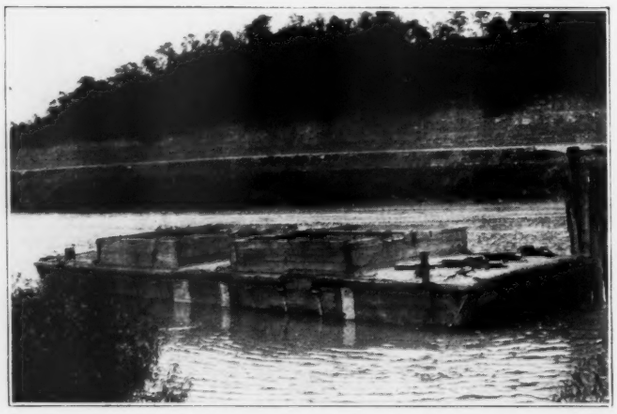
shell bucket and derrick, namely, two boilers, one rated at 100 hp. and the other at 70 hp., a steam swinging engine and a steam-driven 3-drum hoisting engine. The derrick is of timber construction with four stiff legs and a 70-ft. boom. A Hayward 1½-cu.yd. clam-shell bucket handles the entire dredging requirements.

With but a half-mile tow to the slack-line cableway, only one scow is needed. Carrying but 90 cu.yd. of material, the scow is easily handled and dumped. Chain-operated side-dump gates permit rapid loading and unloading.

The slack-line cableway is a complete Street Bros.

Plant view from the state highway.

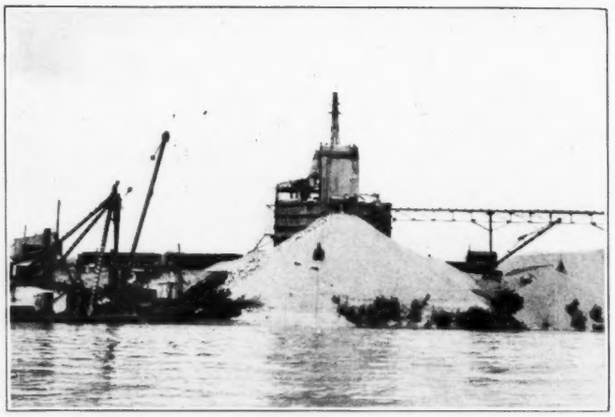
Machine Works unit, consisting of a 100-ft. steel mast (located adjacent to the tipple to enable the bucket to dump directly into a grizzly hopper), a 1½-cu.yd. bucket (rebuilt to carry 2½ tons), and hoist. The last-named consists of a 2-drum Street Bros. hoist driven by a 100-hp. General Electric motor all located in an inclosed building command-



The 90-cu. yd.-capacity scow.

ing an excellent view of the entire plant and river operations. Williamsport wire rope is used on the cableway.

Simple but efficient, would describe most appropriately the company's processing methods. With but two vibrating screens, a jaw crusher and two sand-settling tanks, comparatively few mechanical units are employed, resulting in low production costs. From the slack-line cableway, the material is received in a grizzly-screened hopper

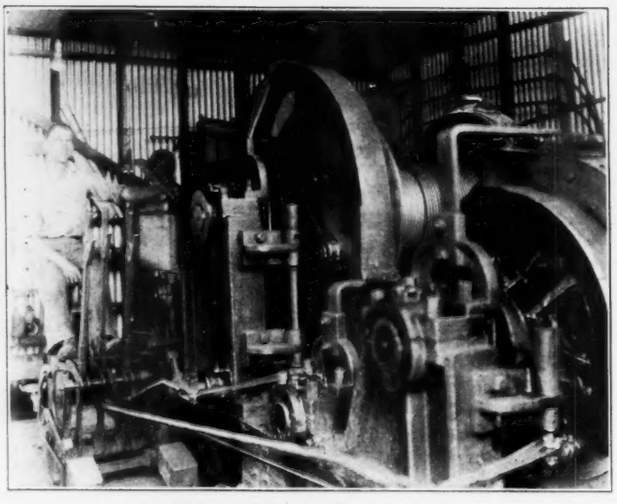


View of the plant from the Ohio River.

which, in turn, delivers it to the top deck of the first vibrating screen. This deck acts as a scalper, sending plus 2¼-in. gravel to a Cedar Rapids 9-in. by 36-in. jaw crusher where it is reduced to 1¼-in. size. A bucket elevator returns the crushed gravel to the scalper deck, thus completing a closed circuit.

Both vibrating screens are Simplicity 3-ft. by 6-ft. units, the first having two decks and the second three decks, each unit being driven by a 3-hp. motor. The size of screen cloth for the two screen units is, of course, determined primarily by specification requirements. A typical arrangement would be as follows: 2¼-in. and ¾-in. square-opening, punched-plate on the top and bottom decks of the first screen, and 5/16-in., ⅛-in., and 1/10-in.-mesh wire-cloth panels on the three decks of the second vibrating screen. The last two panels separate two sizes of sand, a ⅛-in. to 1/10-in., and a ⅛-in. to 5/16-in. sand, each grade being sent to individual Telsmith No. 7 sand-settling tanks.

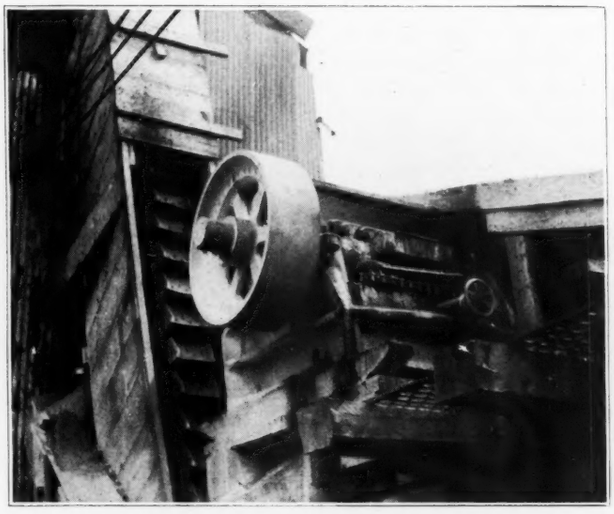
The bin structure beneath the processing equipment serves for loading the cars on a track extending alongside and the trucks from the tunnel between the supporting piers. At present four compartments with a combined capacity of 1,000 tons, store the two grades of sand and two sizes of gravel. Plans are being considered for an addition to the



The slack-line cableway hoist.

structure which will double the present storage capacity.

An excellent gallery-conveyor installation provides ample stock-pile capacity for peak shipment requirements. The gallery-and-conveyor structure, which was built by the Fairfield Engineering Co., extends parallel to the sidetrack for a distance of 250 ft. from the tipple. The 18-in. belt is in a position to intercept the classified gravel from the



Jaw crusher which reduces the "oversize."

vibrating screens before it reaches the bins, and a Link-Belt tripper discharges the gravel to the desired position beneath the gallery. The gallery itself is a fabricated-steel structure, 33 ft. high, mounted on four fabricated-steel piers. In the plans for the addition to the bins, provisions are

A. C. Swift, general manager, and G. H. Cooper, superintendent.

also made for an extension to the gallery conveyor of 150 ft., thereby lengthening it to 400 ft.

Sand is also stocked in ground piles on a site opposite the bin structure. At present the sand is washed out to the piles in a flume. This will be changed, however, to a belt conveyor at some future time.

All stocked materials are recovered by means of a P & H 206 clam-shell-bucket crane. With the B & O sidetrack paralleling the gravel stock-pile system, cars can be loaded direct from the pile. With the other improvements, a 20-car extension to the sidetrack is contemplated for a location along the river front.

The sand plant, or plant No. 2, produces the bulk of the company's sand output. Its 27-acre pit is worked by means of a Thomas slack-line cableway outfit employing a 1-cu. yd. bucket. The processing equipment will be revamped with modern equipment according to plans for its future development.

Handling Done Entirely by Conveyors

(*Continued from page 42*)

which drives, through a 12-strand Flex-Mor V-belt drive, a 125-kw., 250-v. generator. This engine has a Brown exhaust-temperature indicator. The second generating unit is a Fairbanks-Morse 2-cyl., 100-hp., semi-Diesel engine which drives a Crocker-Wheeler 250-v., 300 amp., 75-kw. generator through an 11-strand Flex-Mor V-belt drive. Both generators feed a Gregory Electric Co. central switchboard, provided with individual voltmeters and ammeters. This switchboard also has controls for all plant motors. Only 425 to 450 amp. is required to run the plant at capacity.

Among other equipment in this building is a small pump, driven by a 5-hp. motor, which furnishes cooling water for the engines. There are also a Schutte-Koerting recirculating water-cooler, and a small Fairbanks-Morse gasoline-driven air compressor and receiver tanks for starting the engines.

Water for washing the material and for other purposes is secured from an abandoned pit near the plant. A Fairbanks-Morse size 6 centrifugal pump, driven by a 60-hp. motor, pumps the water a distance of about 500 ft. to the plant. A 2,000-gal. tank alongside the power-house stores water for cooling the engines. An underground tank of the same capacity provides for recirculation of the cooling water.

Oil for the Diesel engines is stored in two 10,000-gal. tanks, both above ground near the screening building. There is also a 200-gal. underground tank alongside the power-house.

The type of plant and its location were laid out by L. A. Wilson & Co., Inc., engineers and contractors, who also had the general contract for the construction.

The plant was designed by the Link-Belt Co. All the equipment, with a few exceptions, is of Link-Belt manufacture. The structural-steel framework for the buildings and the corrugated-metal roofing and siding were furnished under a sub-contract by the Warden-Allen Co. Allis-Chalmers direct-current motors are used and all drives except the crusher have Link-Belt silent chains. Most of the conveyor belting is Link-Belt "Service Brand" and some was furnished by the U. S. Rubber Co. Crane Co. valves and fittings are used an all water lines.

The main office of the Sheridan Sand & Gravel Co. is at 406 Maloney Bldg., Ottawa, Ill. The officers are: Louis A. Wilson, president and general manager; Le Roy B. Light, vice-president; Joseph G. Dingle, secretary and treasurer; and Ralph G. Near, sales manager.

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Mining, Crushing and Grinding Methods at the Giant Cement Quarry*

By S. G. McANALLY
Chief Chemist, Giant Portland Cement Co.

THIS is one of a series of papers describing mining and crushing methods and costs at cement-plant quarries throughout the United States and deals directly with the methods employed and costs obtained at the Reliance quarry of the Giant Portland Cement Co. at Egypt, Pa., although it is more or less descriptive of the methods used throughout the Lehigh Valley cement district. Systems of transportation vary according to local conditions, such as proximity to the mill, depth of quarry floor with relation to the mill level, etc. Methods of prospecting differ mainly in the type of drills used. Systems of storage, crushing, and grinding vary chiefly in the types of units.

Most of the information regarding the early history of the Lehigh district was obtained from the *History of the Portland Cement Industry of the United States,* by Robert W. Lesley, the first president of the Portland Cement Assn. The writer is indebted also to Charles Clader, quarry superintendent, Giant Portland Cement Co., for valuable information regarding present and past methods and equipment.

Some information on the geology of the district has been gleaned from Prof. Benjamin L. Miller's report on the limestones of Pennsylvania. Other statements regarding the geology are based on personal observation and on the interpretation of the analyses of samples of rock from numerous test holes drilled over a large area.

The Lehigh Valley cement district was discovered and brought into being through the need of cement mortar in the construction of artificial waterways before the advent of the railroads.

About 1830 a small cement plant was built on the Lehigh Canal at Seigfried's Bridge, under the ownership of Gen. J. K. Seigfried, one of the pioneers of the industry. The natural cement manufactured was used largely in the construction of the Lehigh Coal & Navigation Co. canal from the coal regions to Easton, Pa. Other cement plants followed and the success of the natural-cement works in the Lehigh district led to the establishment, in the eighties, of a plant at Egypt, Pa.

The Giant Portland Cement Co., originally the American Cement Co., was organized in 1883. In 1898 the company was operating four plants in the vicinity of Egypt. The kilns used were the upright, intermittent type, but in the latter year rotary kilns 60 ft. long were installed at one of the above plants. In 1900 the Central mill was built and was equipped with rotary kilns only. The Reliance mill was built in 1905 and the present quarry was opened in the same year.

* Reprinted from U. S. Bureau of Mines Information Circular 6448.

The cement rock of the Lehigh district, as found in the Reliance quarry, belongs to the Jacksonburg formation and is a continuation of a belt that extends from Belvedere, N. J., on the Delaware River, through Stockerton, Bath, and Northampton, to about 10 miles west of the Lehigh River. The belt is only a few miles wide, yet there are about 25 cement plants located on it.

The strata consist of a basal layer of crystalline limestone mixed with dolomite, and an upper layer of argillaceous limestone (cement rock) which comprises most of the formation. The northern boundary of the cement rock can sometimes be determined by an abrupt change in the topography, the line of contact being at the base of the steep slopes which mark the southern margin of the slate belt (Martinsburg formation) which overlies the Jacksonburg limestone. The southern boundary is sometimes marked by a change in slope to the more soluble underlying high-grade limestone (Beekmantown formation), but the geology is not regular.

In some areas large lenses of high-grade cement rock are embedded in very low-grade material; sometimes the rock is covered by residual clay to a depth of 50 feet. There are several large outcrops of dolomite which are probably overlain with cement rock.

The cement rock is a black slaty stone, intermediate in composition between limestone and slate. The calcium carbonate varies from 55 to 85 per cent. In the developed areas the variation is not so extreme and the rock will average about 75 per cent. calcium carbonate. This is the approximate percentage required in the raw mix for the manufacture of Portland cement; hence the name "cement rock." The rock is comparatively soft and is laminated due to its slaty nature. Following is the analysis of the average cement rock from the Reliance quarry:

	Per cent.
Silica	14.80
Iron oxide and alumina	7.20
Calcium carbonate	72.50
Magnesium carbonate	4.10
Water, alkalies, etc.	1.40

The above material must be mixed with some high-grade limestone in order to increase the calcium carbonate content to the desired percentage (about 75 per cent.). Some cement companies in the Lehigh Valley are more favored than others in having, adjacent to their plants, deposits of limestone which can be quarried and delivered to the mill for the same cost as the cement rock. At some mills the cement rock is sufficiently high in calcium carbonate to require the addition of clay or other argillaceous material in order to regulate the mix.

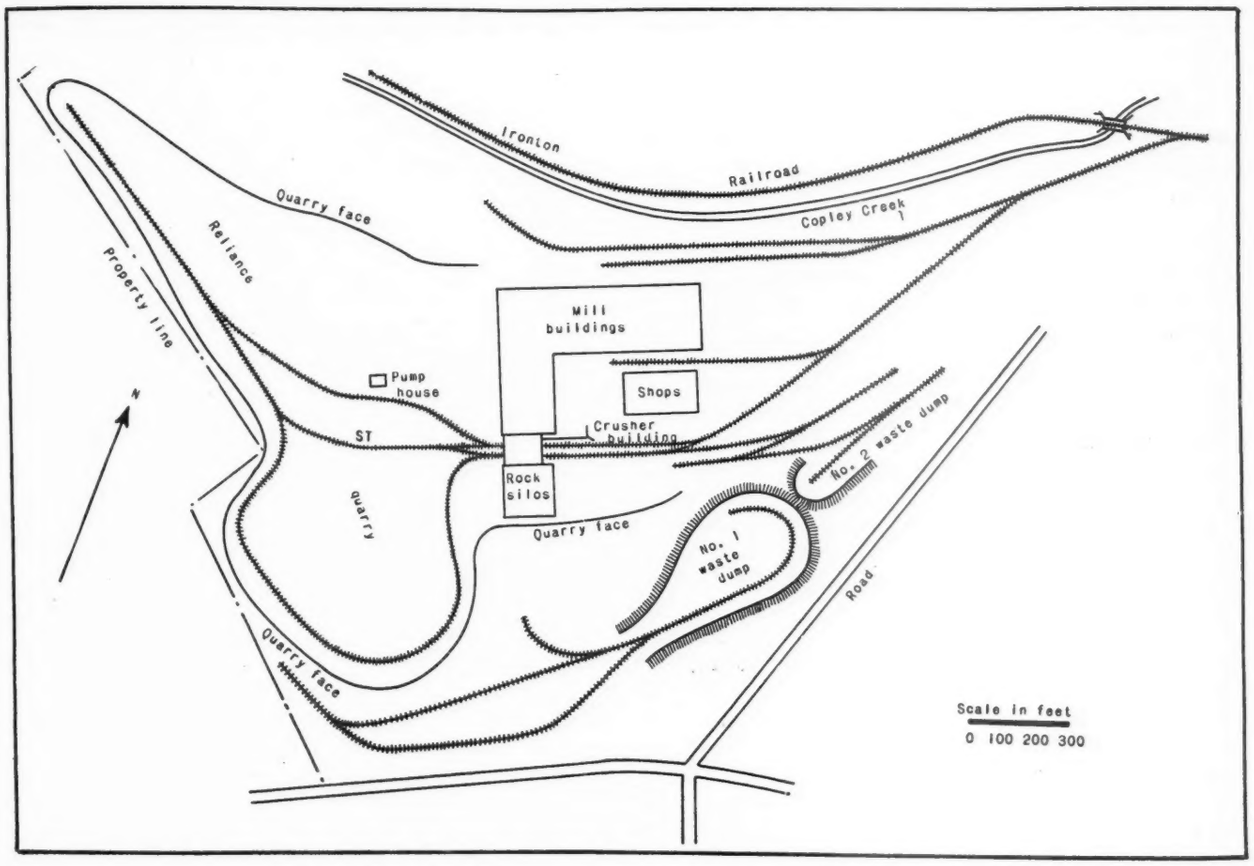

Fig. 1. Plan of Reliance quarry, Giant Portland Cement Co., Egypt, Pa.

No workable deposit of high-grade calcium limestone has been discovered in the vicinity of Egypt, and the limestone used at the Giant Portland Cement Co.'s plants is purchased and shipped from Annville, Pa. The cost delivered at the mill is $2.40 per long ton, or about seven times as much as the cost of the cement rock. Therefore it is not economical to work low-grade deposits of the latter.

In some places the cement rock outcrops, but as a rule it is covered by a clay overburden which varies in thickness from 1 to 20 ft. Sometimes the clay extends to greater depth in pockets, chasms, fissures, or wide cracks in the otherwise solid rock. Occasional seams of quartz and soapstone are encountered but not in sufficient quantity or thickness to interfere with the method of quarrying.

Good cement rock is found to a depth of at least 230 ft. within the area of the present workings at the Reliance quarry. This area is located in the southeast section of the quarry (see Fig. 1). The strata dip in a northwesterly direction at an angle of about 5 deg. Faults are rare and folding occurs only in a few places. The composition of the rock varies considerably in localized sections but the method of quarrying reduces this variation so that the rock delivered to the mill will average between 70 and 75 per cent. calcium carbonate. A plan of the quarry and the track layout is shown in Fig. 1. A section of the present face showing location of strata is shown in Fig. 2. A longitudinal section of the rock below the floor of the quarry is shown in Fig. 3.

Considerable prospecting has been done on the Reliance and adjacent properties of the company. One gas churn drill is used continually for this purpose. Test holes 6 in. in diameter are drilled to a depth of from 100 to 200 ft. In new properties the holes are first drilled on the corners of a 250-ft. square and if the results of the tests indicate that further prospecting is necessary, the spacing is reduced, either for the purpose of tracing high-grade rock when it is encountered or to eliminate any doubts as to the value of the prospected area. Numerous prospect holes have been drilled from the surface of the Reliance quarry to a depth of 230 ft. The quarry floor has been prospected to a depth of 100 ft. As the present face is moved ahead, additional test holes are sunk in the new floor area on 100-ft. squares, and the results are tabulated and recorded for future reference.

Loomis No. 4 Clipper drill is the type used. The average footage drilled per day of 10 hours is approximately 40 ft. The speed varies with the strata encountered, which consists of clay, cement rock, veins of limestone and quartz, dolomite, and slate. The dolomite is the hardest rock encountered in large masses. The rate of drilling becomes slower with increasing depth. When water is encountered in the drill holes the footage drilled in unit time is much less than the average. The average cost of drilling prospect holes is $0.405 per ft. This cost includes labor (two men to a drill), material and fuel, repair labor, and also

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covers the time used in moving from one location to another.

Samples are taken from each 5 ft. of drill hole. Each time the sludge is bailed out the first portion is thrown away and the second fill of the bailer is caught in a water pail; all other bailings are thrown away. The sample in the pail is washed free from clay, is mixed well, and put into a small tin box or a tobacco can, several of which are provided for the purpose. Each can is marked with the number of the test hole and the depth at which the sample was taken.

Samples are dried and pulverized and a determination for carbonate, in terms of calcium carbonate, is made on each one by the simple and rapid acid-alkali method. After all samples from one hole are tested in the above manner a composite is made of all the samples of that hole. A carbonate determination is made on the composite; the result should agree with the arithmetical average of the individual results within 0.2 per cent. The actual lime in the composite, determined by the potassium permanganate method, is calculated to calcium carbonate. The difference (plus or minus value) between the actual calcium carbonate and the carbonate obtained by the acid-alkali method is added to the individual results so as to obtain the correct values. The composite samples are also analyzed for magnesia.

In using the acid-alkali method for the estimation of calcium carbonate in limestone, cement rock, and cement mixes, it is customary to standardize the acid and the alkali solutions with a standard sample of material approximating the composition of the samples to be tested. If the standard sample contains 42 per cent. lime (75 per cent. $CaCO_3$) and 2 per cent. magnesia, a sample of rock which by this method analyzes say, 70 per cent. calcium carbonate, contains the equivalent of 70 per cent. $CaCO_3$ and 2 per cent. MgO. But if the actual MgO

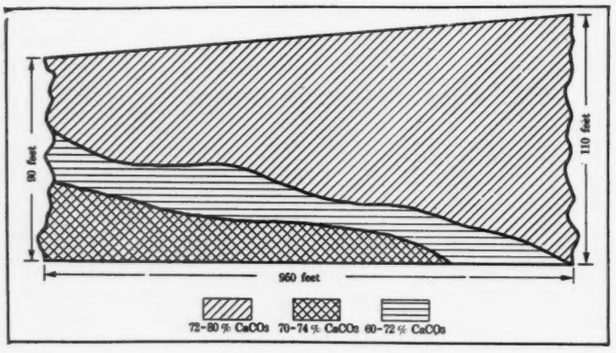


Fig. 2. Section of south face showing composition of strata.

is more than 2 per cent. then the $CaCO_3$ will be less than 70 per cent. and, as the percentage of magnesia may vary in different sections and strata of a property, it is necessary to make a determination of the lime in the composite in order to check and make any correction of the acid-alkali determination.

When the acid-alkali result exceeds the actual calcium carbonate content, the difference, especially if considerable, can be attributed to a higher percentage of magnesia than that in the standard sample. This difference multiplied by 0.4 will equal approximately the increase in the percentage of magnesia. Other acid-soluble basic impurities affect the acid-alkali determination, but to a lesser degree.

Based on the analyses, areas are mapped out so that the average calcium-carbonate content of the whole area will exceed 70 per cent. The available tonnage is estimated on the basis of 155 lb. per cu. ft. Due to the fairly regular and solid formation of the rock, especially below the quarry floor, the tonnage can be estimated closely.

The open-pit method of quarrying has been used from the beginning of operations in the Reliance quarry. The first cut was made at the mill site in order to excavate for the crusher and adjacent buildings. The area extending from the mill to the northwest was the first developed and worked due, no doubt, to the fact that it had less than 1 foot of overburden. When the good rock in this section became exhausted, or nearly so, the area to the southwest was prospected and developed. The overburden in this area consists of a yellow clay. The amount of clay per thousand tons of cement rock is approximately 100 cu.yd. This estimate applies only to the southwest area.

This heavy clay overburden is removed by stripping with a power shovel and a drag-line scraper supplemented with some pick and shovel work. Due to the clay-filled crevices previously mentioned which, in part, can not be stripped by the regular methods with economy and safety, some waste is shot down with the rock. The waste removed in the quarry proper by the power shovels and transported to the No. 2 waste dump amounts to approximately 2 per cent. of the rock recovered. A certain amount of waste is unavoidably mixed with the rock going to the mill but it is only harmful in that it requires a larger amount of the expensive limestone to regulate the mix.

Considering the nature of the overburden and its amount, the fact that 98 per cent. of the material shot down can be recovered, that high and long working faces are possible, the open-pit method and the use of power shovels is logical and economical.

The present quarry floor is on the same level as the mill site but it is low with respect to the surrounding country. The maximum height of the quarry face above this level is 120 ft. However, due to the proximity and greater depth of other quarries, no drainage is necessary at present in the Reliance quarry. When the supply of cement rock above the present floor level is exhausted and if it is decided to sink deeper so as to recover the good rock below, it will then be necessary to provide for drainage.

Stripping operations are carried on between April and October. The first cut is made with a Bucyrus steam shovel with a ¾-cu.yd. dipper. This is followed later by a Marion steam shovel which has been converted into a drag-line scraper and equipped with a ¾-cu.yd. Page scraper bucket. Most of the clay is found in wide chasms and long

crevices and the drag-line is very suitable for removing it. In the narrow lateral crevices which are inaccessible to the scraper bucket several men are employed to dig the clay and shovel it into the path of the bucket. All overburden is removed as far as possible.

The clay is loaded directly into Easton side-dump cars. The cars hold 1¼ cu.yd. and are hauled to the No. 1 waste dump by Vulcan steam locomotives. A train consists of six cars. The dump is located on the slope of a hill. The length of haul from the stripping area to the dump is between 1,500 and 2,000 ft.; the grade is less than 2 per cent. The track layout is shown in Fig. 1. The gauge is 30 in. and a 24-lb. rail is used.

The average amount of overburden removed in 10 hours is 175 cu.yd.; this figure applies to the drag-line operation in which the stripping is tedious and expensive due to the awkward position of the clay. The drag-line scraper and two locomotives are used at present. The stripping crew consists of 14 men as follows: 2 men on the drag-line, 1 man on each locomotive, 6 pick-and-shovel men to supplement the scraper, and 4 men on the waste dump to empty cars and level off. One foreman has charge of stripping, drilling, and prospecting.

The total cost of stripping over a period of four years amounts to $0.599 per cu.yd.

Stripping operations are kept well ahead of drilling, and enough rock to supply the mill for about two years has been stripped.

In mining, the general plan is to develop long and high faces so as to bring down with one shot sufficient rock to supply the mill for several months. The Reliance mill requirements are between 25,000 and 30,000 long tons per month. The Central mill, when operating, requires about 18,000 tons per month. Both mills are supplied from the Reliance quarry. All the rock is used in the manufacture of cement. Waste inclusions amount to about 3 per cent. of the rock. About two-thirds of this can be easily segregated, loaded separately, and transported to the No. 2 waste dump which is located close to the stripping dump but at a lower level on the side of the same hill. The haul to the lower waste dump is too steep to be made directly; it is accomplished by making one long level haul and three short hauls of 4 per cent. grade. The total length of haul from the quarry face to the lower waste dump is approximately 3,500 ft.

The quarry face is perpendicular. From the east to the west side the height of the face increases from 85 to 110 ft. A circular face is developed. It is believed that this form of face gives the best blasting results with respect to the amount of explosives used per ton of rock for primary and secondary blasting.

Churn drills made by the Loomis Machine Co. are used for the primary drilling (and for prospecting). There are two gasoline drills, model JA, one traction and one half-crawler, and two steam drills, one traction and one horse-drawn. The gasoline drills are preferred as they are found to be more economical to operate and are more convenient with respect to supplies, such as fuel and water. A horse and cart delivers the coal from the mill to the steam drills, dragline, and to the locomotives. The driller's helper brings the gasoline in 5-gal. cans from the mill. A pipe line from the mill to the top of the quarry delivers either water or air. The air pressure is 65 lb. The air is used for operating an I. R. jackhammer when it is found necessary to blast some of the rock in order to level the surface or to fill in some of the crevices prior to locating the churn drill. Where the crevices

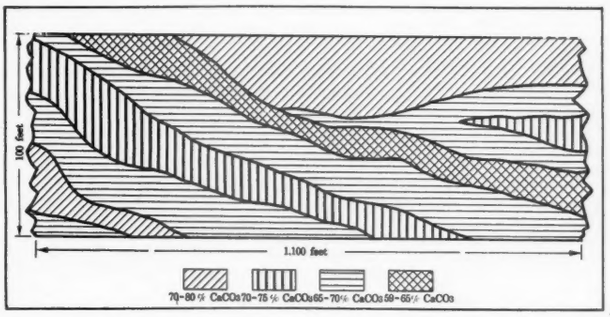


Fig. 3. Longitudinal section of rock below quarry floor.

are wide, the churn drill rests on a cribbing made from railroad ties.

Oil-well drill steel 5⅝ in. in diameter is used. Drill bits weigh 250 lb. and are dressed to 6⅛ in. diameter. Drill stems measure 4¼ in. by 20 ft. The bits are dressed in an Armstrong bit dresser. Casing is used only in clay or loose material.

The average drilling speed is 45 ft. per day of 10 hours. When in hard rock, bits have to be changed and dressed oftener so as to maintain a uniform diameter of the hole.

Holes are spaced 15 ft. apart, parallel to the face, and carry a 28-ft. burden. Where it is impractical, due to extreme irregularities of the top surface, to drill parallel to the face the holes approach or recede from it, depending on the apparent degree of solidity of the rock at that point. Formerly it was the practice to increase the spacing in the more solid rock but this procedure was discontinued as it was found to make the cost of secondary blasting too high. The number of holes drilled for one shot ranges from 35 to 45. The diameter of the holes is 6¼ in.; the depth is governed by the height of the face which varies from 85 to 110 ft. All holes are drilled 6 ft. below the quarry floor.

Drilling starts immediately after each shot is made. Positions of the holes are located by measuring from permanent stakes the exact distances toward the quarry face; this establishes the base line for the row of holes. A record is kept of the location of each set of holes and the position of each hole is plotted on a blue print of the quarry. Each hole is numbered. Samples are taken every 5 ft. and are marked according to the hole number and the depth at which the samples were taken. The samples are treated as described under "Methods of Analysis." They are stored until after the shot is made and the stone used. A composite is made of samples of all holes in the blast, and a complete analysis is made of it.

The explosives used for primary blasting are 60- and 40-per cent. gelatine dynamites. The cartridges are 5 in. in diameter and 24 in. long. Cordeau is used for detonating the charge. No. 6 detonators and Beaver fuse (speed 40 sec. per ft.) are used for firing.

The powder used for primary blasting is not kept in storage but is delivered to the quarry by auto trucks on the day the shot is to be fired. It is distributed to all the holes in proportion to the amounts and the strengths required. The boxes are opened by extra labor (not the loading crew). There are from two to four loading crews of three men each. They fill the holes in rotation and under the supervision of the explosive company's representative who acts as powderman and who is responsible for the shot.

In loading each hole the Cordeau is attached to the bottom stick of powder. As a rule the bottom is loaded with the 60-per cent. powder and the top with 40 per cent. The thickness of the burden at different heights also governs the distribution of the different strengths of explosive. When pockets are encountered, that portion of the hole is filled with clay. The holes are loaded to within 20 to 25

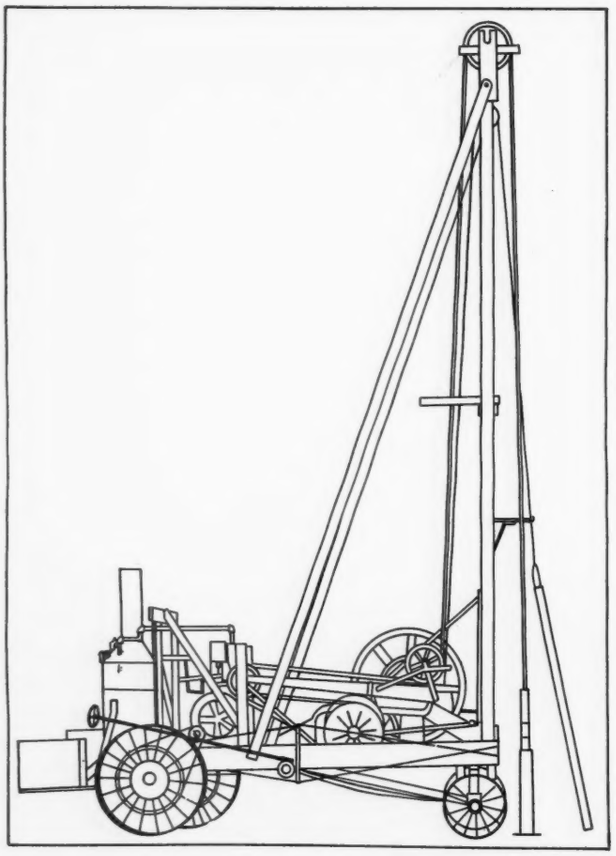


Fig. 4. Steam-operated well drill.

ft. from the top and the remainder is filled with clay and tamped down.

After all holes are loaded the ground is cleared of powder boxes and other obstructions, a trunk line of Cordeau is run from the first to the last hole, and the free end of the line is connected to the detonator and fuse. The fuse is lighted with a match.

All holes are loaded and fired on the same day. Between 10 and 15 minutes are required to load each hole.

The fragmentation desired is dependent on the size of the primary crusher which is a 48-in. by 60-in. jaw type. There is no minimum limit as all the stone is used for making cement.

In the drilling and blasting operations holes have been drilled with 16-ft. centers and 24 ft. of burden; 18-ft. centers and 26 ft. of burden; and different strengths of explosives, 30, 40, 50, and 60 per cent. have been used under these varied conditions. The most economical results with respect to the total cost of primary and secondary blasting have been obtained by drilling the holes 15-ft. centers and carrying a 28-ft. burden.

Ingersoll-Rand Jackhamers, Type BCR4, are used for drilling the large boulders. The air is delivered from the compressor to the quarry over a 2-in. line. Several 1¼-in. air lines branch out from the main line to different sections, and ¾-in. leads connect the main line to the drills. The air pressure at the drills is between 70 and 80 lb.

The drill steel is ⅞-in. hexagon stock; 1¼-in. bits are used for 1½-in. diameter holes, and 1¾-in. bits for 2-in. holes. In large boulders in which the depth of the holes exceeds 10 ft., the holes are made 2 in. in diameter; shallower holes are made 1½ in. in diameter. The drilling speed is about one foot in 4 minutes.

The large boulders encountered by the steam shovels are cast aside and drilled by a crew of two men used for this purpose and for barring down loose boulders which are also drilled. Holes are drilled to the centers. The dynamite used is 1¼ in. diameter 40-per cent. gelatin. No. 6 detonators and Beaver fuse (speed 40 sec. per ft.) are used for firing. The holes are filled to within 2 in. of the top with the powder, the cap and fuse are attached to the last stick, and the last 2 in. of the hole is filled with clay and tamped well. The fuses are cut to not less than 30 in. and are lighted with a wick.

In primary blasting the shots will average 3.7 tons per lb. of explosive. In secondary blasting the ratio is approximately one pound of explosive to 44 tons of stone.

Two Bucyrus No. 70 traction-type steam shovels are used for loading the stone. The dippers are 2½-cu. yd. capacity. One Bucyrus No. 65 is held in reserve. Two shovels are able to load between 180 and 190 long tons per hour; this includes the intermittent stops caused by transportation delays. There are 3 men on each shovel: an engineer, a fireman, and a craneman. Working 8 hours per day and 5 days per week, the mill requirements of from 25,000 to 30,000 long tons per month can be supplied.

Three Vulcan steam locomotives running on standard-gage 60-lb. rail are used to transport the rock to the crusher. The grade to the crusher is practically level. Atlas 10-ton side-dump cars are used. The load in each car is 7½ long tons. Five

cars make up a trainload. The fuel used on the locomotives, shovels, etc., is run-of-mine coal. It is hauled by a horse and cart to the shovels from a storage pile located on the track adjacent to the pump house. The locomotives obtain their coal from the same source. The water for the boilers is treated by the lime-soda process.

From the crusher to the quarry face the locomotives follow the horseshoe track around the face and make the return trip with the load over the straight piece of track (ST. in Fig. 1). The cars receive half of their load from the shovel nearer to the mill, and the load is completed by the further shovel. This loading system helps to mix the rock and reduces the variation in the composition. The haul to the crusher is about 1,200 ft.

The total quarry crew (exclusive of the men on primary drilling, blasting, and stripping) consists of 17 men: 3 on each shovel, 1 man on each locomotive, 2 powdermen for secondary drilling and blasting and for barring down, 2 pitmen, 2 track repairmen, 1 man at the crusher to dump cars, and 1 foreman.

The primary crusher is located below the level of the tracks and rests on a solid rock foundation. Fig. 5 is a sectional view of the silos and the crushing equipment.

A small drum hoist geared to a 15-hp. motor is used for unloading the cars. The lift is applied through an overhead block and tackle. The cars are dumped directly on to a 5-ft. by 12-ft. Traylor Sheridan grizzly feeder which is driven by a variable-speed 25-hp. motor. The feeder has a reciprocating motion and carries the rock ahead slowly and uniformly to a 48-in. by 60-in. Traylor jaw crusher belted to a 200-hp. motor. The fines, 3 in. and under, pass through the grizzly bars. The by-passing of the fines which contain most of the clayey material prevents choking of the crusher. The capacity of the primary crusher is 250 tons per hour crushing to 8 in.

The crushed product and the fines which pass the grizzly are picked up by a 48-in. by 60-ft. Link-Belt bucket elevator and delivered to the secondary crusher, a 42 by 48-inch Jeffrey swing-hammer mill directly connected to a 200-hp. motor. No intervening storage bin is required. The Jeffrey mill is very efficient for crushing cement rock. In order to reduce dust losses in the dryer stack several of the mill hammers have been removed.

The Jeffrey product, 3 in. and under in size, drops through a side chute to the lower run of a Link-Belt carrier which is driven by a 50-hp. motor. The buckets are 30 in. by 36 in. and overlap each other. The capacity of the carrier is 300 tons per hour. The carrier passes over a Merrick Weightometer which weighs and records the quantity of rock going to the storage silos.

There are eight round concrete silos (two rows of four) with an intersticial row star shaped. The storage capacity is 12,000 tons. One section of the silos is 65 ft. deep (inside depth) and the other is 40 ft. deep. The latter is built over the railroad tracks, and double duplex gates 24 in. by 24 in. are attached to the bottom of these four silos. This permits the crushed rock to be loaded into gondolas and shipped to the Central mill of the company.

A traveling tripper is used for dumping the carrier buckets containing the crushed rock into any of the silos. A small back-geared drum hoist driven by a 2-hp. motor pulls the tripper in a counter direction to that of the carrier; the forward movement is effected by the pull of the buckets.

The empty buckets descend at the rear end of the silos and travel through a tunnel under the latter.

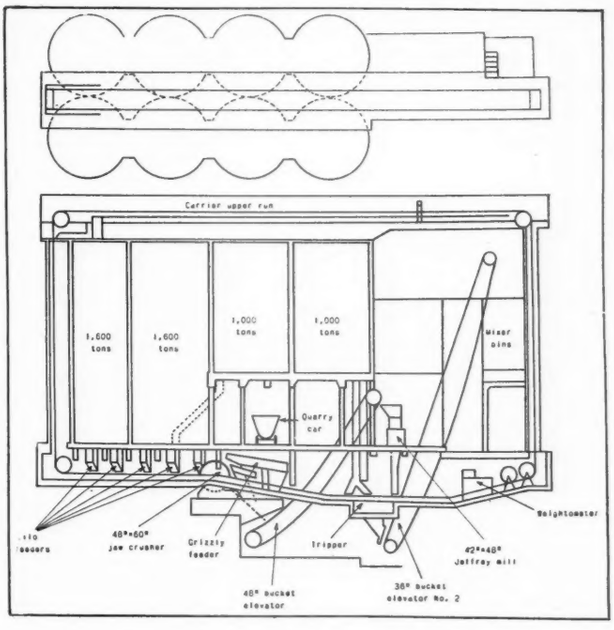


Fig. 5. Sectional view of silos and crushing plant.

Under each silo there is a Link-Belt reciprocating feeder. The feeders are driven through chain drives and clutches from a line shaft which is driven by a variable-speed 10-hp. motor. They can be adjusted to withdraw the rock at a uniform rate from any number of silos at the same time. By feeding from several silos simultaneously, the rock is blended and the combined flow of material is more uniform in composition than that which entered the silos.

The feeders deliver the rock to the lower run of the carrier which conveys it to a point ahead of the secondary-crusher discharge chute. At this point a tripper dumps the blended rock into the boot or pit of a 36-in. by 96-ft. Link-Belt bucket elevator (elevator No. 2, Fig. 5) driven by a 40-hp. motor. The empty carrier buckets travel a few feet forward and pick up the product of the secondary crusher as already described. In case of a shutdown of the carrier the product of the secondary crusher or the crushed rock in the two north end silos can be fed directly to the No. 2 elevator which delivers the rock to the mixer bins.

In the crushing department there are five men and a foreman. The three silo men, one on each 8-hr. shift, keep the mixer bins supplied with

cement rock and limestone; the latter is stored in two of the silos. One man operates the upper tripper (which distributes the rock to the silos) and collects an average daily sample of the rock from the carrier buckets. The sixth man helps in the unloading of cars of limestone and does odd jobs.

There are two reinforced-concrete mixer bins each having a capacity of 200 tons. One is used for cement rock and the other for the crushed limestone. The mixing room is located under these bins. Here the cement rock and the limestone are proportioned to make the raw cement mixture. The bins are equipped with duplex gates through which the stone feeds into the hopper of the Toledo scale. The hopper is drop-bottom and discharges at a uniform rate onto a horizontal belt conveyor, 39 in. by 7 ft. 3 in., which carries the mixture to a 16-in. by 35-ft. overlapping bucket elevator. The latter delivers the product onto another horizontal belt conveyor 36 in. by 14 ft., to be discharged into the cylindrical drier. The head pulley of the latter conveyor is a 16-in. diameter magnetic separator which picks the tramp iron from the stone.

The drier, 8 ft. by 80 ft., is direct fired by pulverized coal and can dry 67 tons per hour. Between 1,100 and 1,300 tons are dried each 24 hours. The drier, the bucket elevator, the belt conveyors, and the auxiliary conveying equipment for cleaning the drier-stack chamber, are driven by a 75-hp. motor through a Cleveland Worm & Gear Co. speed reducer.

The drier discharges directly into a 42-in. by 48-in. Jeffrey hammer-mill direct-connected to a 75-hp. motor. Originally this mill was one of two installed for secondary crushing. One was found to be sufficient and the other was used to replace a smaller type of hammer-mill at the discharge end of the drier. The main purpose of this tertiary crushing is to break any stray large lumps of stone. The rock is reduced to under 1-in. size and discharges into an inclosed 17-in. by 40-ft. bucket elevator which elevates it to a large rectangular steel bin located over the preliminary-grinding mills. The bin has a capacity of about 100 tons.

There are three men in the mixing department, one man on each shift of 8 hours. There are no men in the drying department. The drier, once started, requires little attention and that is given by the men in the grinding department.

The preliminary grinders are two Bradley Hercules mills. Each is direct-connected to a 300-hp. synchronous motor. The mills are equipped with 9-mesh screens and have an output of 40 long tons per hour per mill.

The ground material discharges into a 24-in. by 45-ft. bucket elevator. The latter discharges into a 24-in. by 60-ft. screw conveyor which distributes the material into a steel blending bin. The elevator and conveyor are chain driven from a Palmer-Bee Co. speed reducer coupled to a 25-hp. motor. There are five discharge openings in the conveyor casing. The first four are equipped with steel slides which are operated by an electrical device that opens and closes them in rotation. This insures a uniform distribution of the material entering the blending bin. The lower section of the bin consists of five hoppers, the centers of which are directly under the conveyor openings. Under the hoppers there are five rotary valves driven through chain drives from a line shaft. The valves withdraw the mix from the bin at a uniform rate and the five streams feed into an 18-in. by 50-ft. screw conveyor. This discharges into a 17-in. by 25-ft. bucket elevator which in turn discharges into an 18-in. by 66-ft. screw conveyor which feeds the tube mills. The valves, the two 18-in. screw conveyors, and the last elevator are all driven by a 25-hp. motor through a Palmer-Bee speed reducer.

There are two tube mills for the final grinding of the raw mix. One is a 7-ft. by 26-ft. Traylor and the other is a No. 20 7-ft. by 23-ft. 6-in. Smidth. The former is driven by a 500-hp. synchronous motor; the latter by a 400-hp. synchronous motor. The mills are charged with ¾-in. steel balls and Cylpebs. The charge in the large mill is 35 tons; in the smaller mill 24 tons. The combined output of both mills is about 50 tons per hour. Ninety per cent of the product passes a 200-mesh screen.

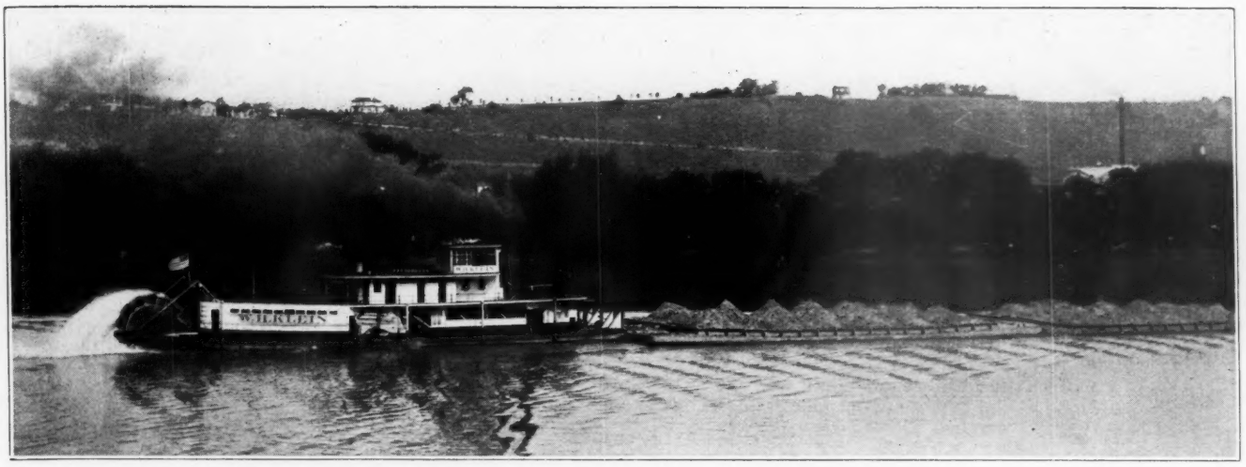
The grinding department operates 24 hours per day, seven days per week. Six men, two on each 8-hour shift, are employed in this department.

There is a large and well-equipped repair shop at one end of which is the blacksmith's shop. A 12-in. by 10-in., Class 38, Pennsylvania Pump & Compressor Co. compressor supplies the air for the jackhammers and for miscellaneous purposes. An Armstrong bit dresser for the well-drill bits and Gardner-Denver bit dresser for the air-drill bits are part of the blacksmith shop equipment.

Repairs on the shovels and the locomotives are made without delay. The men operating these units work on a bonus system and the equipment for mining and transportation is kept in good condition at all times. All boilers are cleaned out every two weeks.

Electrical power is purchased from the Pennsylvania Power & Light Co. The substation equipment consists of two 3,000 kva. transformers and two 100-kw., 220-v., direct-current motor generators. The incoming power is stepped down from 66,000 to 440 volts.

The men employed on stripping, primary drilling and blasting, and in the crushing and grinding departments are paid a straight hourly wage. The crew engaged in transportation, loading, and unloading of the cement rock is paid an hourly wage and a bonus. There are 16 men included in the bonus distribution. The bonus is based on a fixed labor cost and the actual labor cost for transportation, loading and unloading. A maximum labor cost of 8 cents per long ton is the present fixed standard. The difference between the maximum and the actual labor cost is paid to the men.



The "W. H. Klein" and a tow of barges on the Tennessee River.

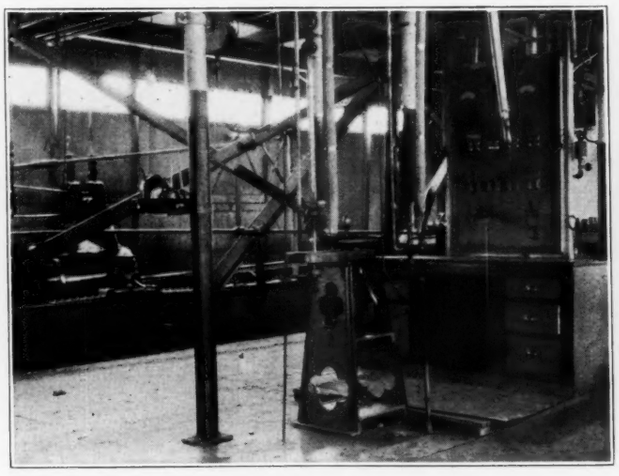
Southern Gravel Producer Launches New Tow-Boat for River Service

All-Steel Stern-Wheeler and Fleet of 6 Barges Haul Aggregates to Chattanooga

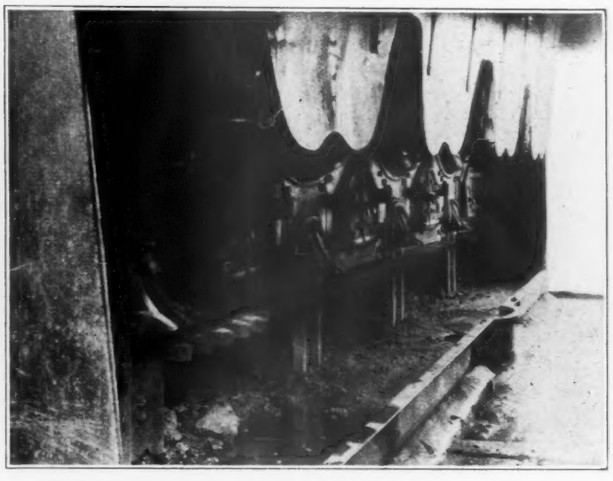
WITHIN the past two years a number of fine contributions have been made to marine transportation in the nonmetallic-mineral industries. With the increased interest in the utilization of all possible water transportation for both raw and finished products as a means of lowering costs, a number of prominent companies have placed marine equipment in service. The Marquette Cement Co.'s operations on the Mississippi River have drawn the attention of the cement industry; in the Great Lakes region the *J. R. Sensibar,* owned by the Construction Materials Co., Chicago, Ill., has set a new mark for diversity of utility and materials-handling ability. In the field of river-gravel transportation, the new equipment of the Dixie Sand & Gravel Co. of Chattanooga is of especial interest in that it represents the latest and finest of its class.

The new river equipment of the Dixie company consists of an all-steel stern-wheeler tow-boat, the *W. H. Klein,* and six steel barges. Already considered one of the finest sand-and-gravel plants in the South, the new equipment places its river transportation facilities on a par with any in the country. Not only is the new tow-boat mechanically well designed, but it provides an unusual degree of comfort for its crew.

The *W. H. Klein* is named for the vice-president of the company who is also general manager for the Southern district of the Pennsylvania-Dixie Cement Corp. It was built by the Howard Shipyard & Dock Co., Jeffersonville, Ind., and was placed in service on April 15, 1930. On its maiden voyage to Chattanooga it followed the Ohio River to the mouth of the Tennessee and thence down the Tennessee, crossing



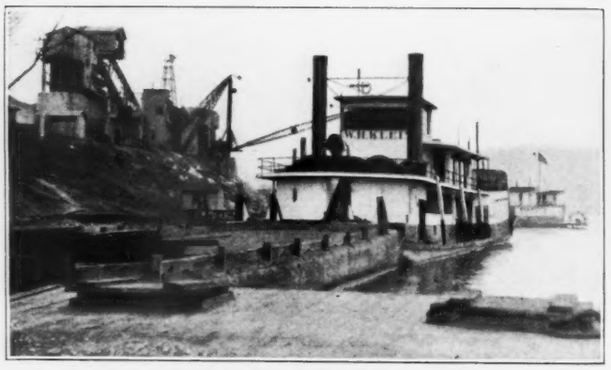
A view in the engine room.



Looking into the boiler room. Note ash well at center.

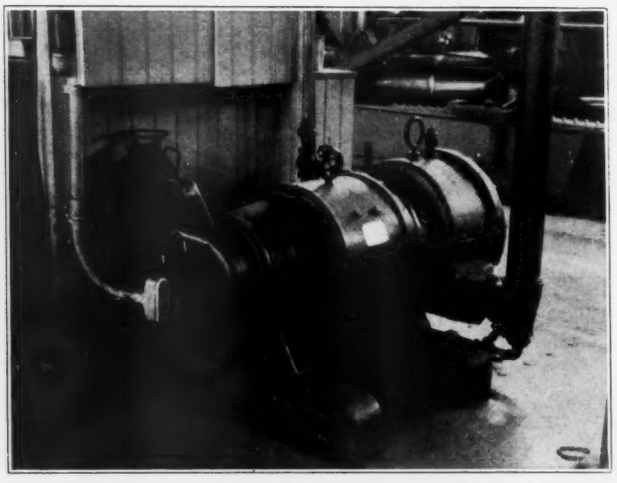
Kentucky and Tennessee, through Muscle Shoals lock.

Because of the necessity of passing through Hale's Bar lock, 32 mi. below Chattanooga, on its way to and from the dredging operations with its tow of barges, the *W. H. Klein's* overall dimensions were necessarily governed by the limits of this lock. This is likewise true of the new barges. The overall length of the tow-boat is 146 ft., the breadth 28 ft. 6 in. Its hull consists of 14 watertight steel compartments with a depth of 5 ft. 2 in. The actual draft is but 42 in.



The tow-boat tied up at the company dock.

Steam for the two engines is furnished at a pressure of 240 lb. by a battery of four marine boilers which were built by the Fowler-Wolf Co., Paducah, Ky. Each is 42 in. in diameter and 26 ft. long and is mounted lengthwise to the boat. Ashes are disposed of through a well extending through one of the hull compartments. The immediate deck area



Turbine-driven generator which supplies current for electric lighting.

in front of the ash doors of the boilers is surrounded by a steel gutter with the ash well in the center. Thus the boiler firing deck can be kept immaculately clean by frequent flushing.

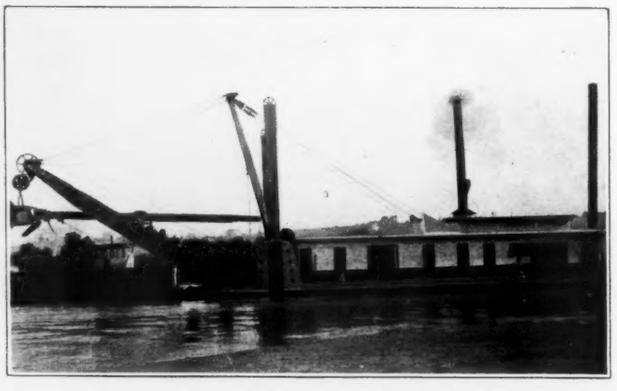
The stern wheel is driven by two Hegewald engines located on opposite sides of the engine room. The stern wheel is 18 ft. in diameter and 19 ft. 8 in. in length. It has 14 buckets each 30 in. wide. Each of these engines has an 18-in. bore with a 6-ft. stroke and was built by the Chas. Hegewald Co., New Albany, Ind. Of interest is the design of the valve, and steamport mechanism. This engine which is said to be one of the first of its type built, is of the poppet-valve type without the familiar

The tow-boat shortly after launching.

steam chest, the valves acting directly in the cylinder head. The elimination of the steam chest is claimed greatly to increase the efficiency of the engine. Operating at one-half cut-off, their rated horse power is 600.

For steering, the *W. H. Klein* is provided with three tandem rudders, operated by a Gardner steam steering engine controlled from the engine room or the pilot house. In the engine room is also located a Westinghouse 5-kw. turbine-driven generator for supplying lighting and other electricity.

The crew's quarters consist of four staterooms, a dining-room, a cook's galley, and shower-baths. The dining-room is in the center of the deck and is flanked on each side by two staterooms, each of which has two bunks. The galley is located to the aft of the dining room; it is equipped with all modern kitchen conveniences. In the locker room modern sanitary plumbing conveniences are provided, including running hot and cold water and shower-



A view of the dipper dredge.

baths. The crew's quarters are furnished with steam heat during cold weather.

Of the nine steel barges operated by the Dixie company in its gravel service, six were recently added to the fleet, which also includes several wooden ones. The new barges were built by the

Nashville Bridge Co. They are 133 ft. long, 29 ft. wide and 7½ ft. deep in the center and 9 ft. deep at the ends, the latter being the equivalent to a 1½-ft. shear. The actual carrying capacity of each barge is 625 tons of gravel.

Although the *W. H. Klein* can handle six loaded barges in tow at one time, its trips to and from

Capt. Thompson, center, and the crew of the "W. H. Klein."

Shell Mound (the dredging location located 35 mi. south of Chattanooga) are made with but three barges because of the limited passageway afforded by Hales Bar Lock. The lock is 60 ft. wide and 267 ft. long. Normally two 133-ft. barges followed by a 120-ft. barge are placed in line in front of the tow-boat. When passing through the lock, the two 133-ft. barges are detached and tied alongside the 120-ft. barge, the tow-boat thus forming a 4-unit rectangle within the limits of the lock dimensions.

The *W. F. Klein* crew consists of a captain, engineer, fireman, two deck hands, the cook and a watchman when operating on a single shift. No watchman is required when the ship is running on double shift, when four men make up the night crew. W. M. Thompson is the captain and Clark Gilreath is the engineer. Chester Padgett is superintendent of the plant.

Talc Output Lower in 1930; Five New Operators in Field

In 1930 the talc industry as a whole experienced a depression, which was characterized by lessened demand, a tendency toward lower prices, and keen competition. Practically all producers, however, continued operations, and prices as a whole held fairly firm. Five new operators entered the field in 1930, one each in California and Nevada, two in North Carolina and one in Vermont. On the contrary, two small operators, one each in California and North Carolina discontinued operations.

The total quantity of talc sold by producers in the United States in 1930 was 179,385 short tons, valued at $2,108,338, according to figures compiled by the U. S. Bureau of Mines, from individual reports furnished by producers. As compared with 1929 these figures represent decreases of 19 per cent. in quantity and of 20 per cent. in value. The figures comprise 4,972 tons of crude talc, valued at $48,913; 385 tons of sawed and manufactured talc, valued at $90,370; and 174,028 tons of ground talc, valued at $1,969,055. There were 28 producers of talc in 1930, three more than in 1929.

Of the total quantity sold, New York State supplied 93,216 tons, valued at $1,192,604, as compared with 109,543 tons, valued at $1,439,272 in 1929; or a decrease of 15 per cent. in quantity and 17 per cent. in value; Vermont supplied 45,881 tons, valued at $399,548, as compared with 60,469 tons, valued at $546,658, in 1929, or a decrease of 24 per cent. in quantity and 27 per cent. in value; and California supplied 14,993 tons, valued at $219,246, as compared with 17,620 tons, valued at $256,977 in 1929, or decreases of 15 per cent. in both quantity and value. The output of talc from California, New York, and Vermont equaled 86 per cent. in quantity and value, respectively, of the total sold in the United States in 1930. The remainder of the output was produced by Georgia, Maryland, Nevada, New Jersey, North Carolina, Pennsylvania, Virginia, and Wisconsin.

Figures for Georgia, Maryland, New Jersey, New York, North Carolina, Virginia, and Wisconsin, were collected in coöperation with the respective state geological surveys.

Slackened demand was reflected in the imports of talc for consumption in 1930, which amounted to 25,779 short tons, valued at $529,822, compared with 31,177 tons, valued at $671,629 in 1929, or a decrease of 17 per cent. in quantity and 21 per cent. in value in comparison with 1929. With the exceptions of 1928 and 1929, however, the tonnage imported for 1930 was higher than for any year on record.

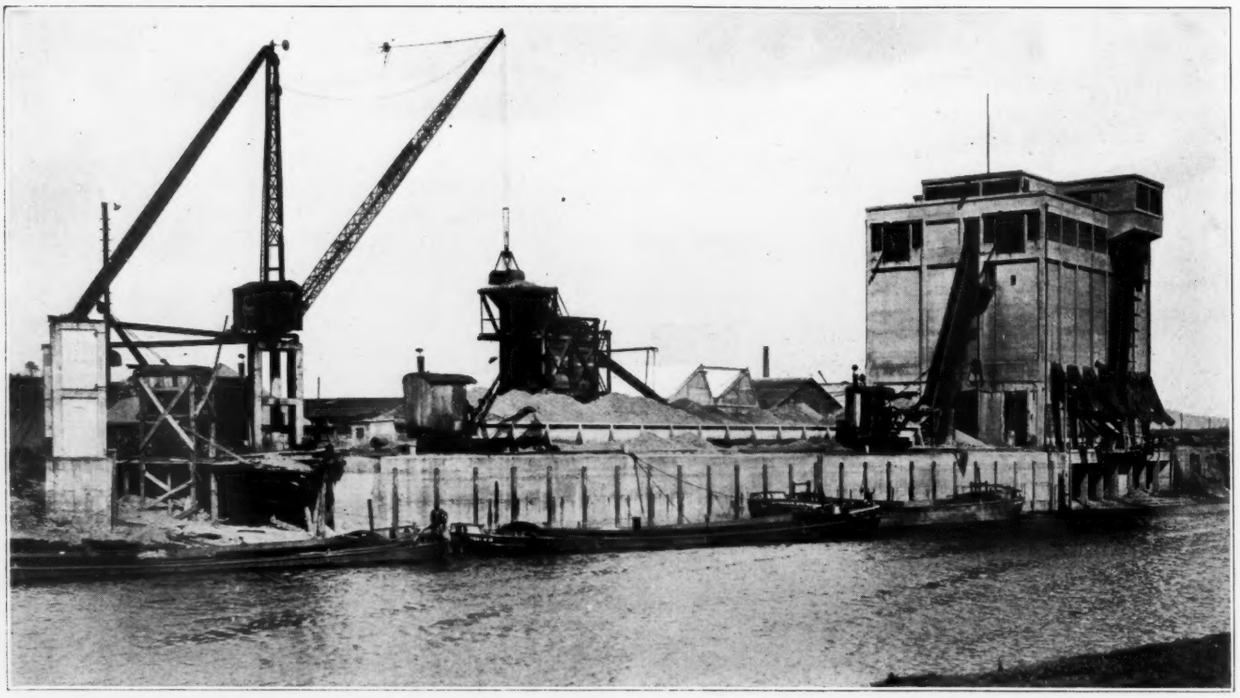
Toilet-grade talc is produced in quantity only in California, and California producers find their principal market in the east. This grade of talc is dutiable at 75 per cent. *ad valorem*, which enables the producers to compete more favorably with toilet grade talcs from Canada, France and Italy. Despite other handicaps, such as transcontinental freight rates and lessened demand, prices were about the same as those prevailing in 1929.

Talc produced in New York is used principally in the paint, paper, rubber, and ceramic industries. Lower prices, declining demand, and sharp competition characterized the industry in this state.

The same may be said of conditions prevailing in Vermont. The product from this state enters chiefly the roofing, paper, paint, rubber and textile industries.

Talc crayons manufactured from high-grade massive talc were produced in Georgia, North Carolina and Vermont. High-grade talc of lava grade was produced in Maryland and North Carolina.

The encroachment of substitutes for talc in some industries is well-known and has made some progress, but as new uses are frequently being found for talc, this factor probably does not have a disturbing influence on the industry at present.



Wharf and gravel plant on River Trent at Colwick, Nottingham, England.

English Gravel Plant Hangs Up Record for Continuous Operation

Has Worked 24 Hours per Day Since Production Started Nine Years Ago

THE Trent Concrete Co., Ltd., claims that its gravel-treatment plant at Colwick, North Nottingham, is the largest in England. It has a capacity of 60 tons per hr. of washed, crushed and graded aggregate and, since the completion of the present plant in 1922, it has worked 24 hr. a day every day in the year!

Although the present plant was completed in 1922, it should be mentioned that constant modification has occurred during the whole period, particularly in regard to the improvement of washers, and the adoption of latest type crushers. Recently this company installed the first Kennedy gyratory crusher to be erected in England. The mill is a monolithic concrete structure. It includes elevated storage bunkers with a total capacity of 5,000 tons, divided into seven compartments.

The whole site of the plant covers 20 acres and forms part of the Nottingham-Colwick estates which abut, throughout their length, on the River Trent whence all the gravel processed by this firm is dredged. Apparently one reason why this firm always manages to be busy when other producers are feeling a slump in trade is the infinite faith which surveyors and other users have in river-dredged gravel; and, rightly so, because this gravel is as hard and tough as any in the country and does not seem to vary much from whatever part of the river it may be dredged.

The gravel comes from the dredges, in a fairly dry condition, to the concrete wharf, whence it is taken by means of a grab-bucket and dumped into the rough-storage silo. As required, it is carried on a belt conveyor to the main elevator working at 90-ft. centers, which carries it to the top of the building for the first screening through rotary screens which remove the sand. In fact, these rotaries classify the gravel as well, so that, at any time, a supply of any particular size of clean uncrushed gravel can be had; but, normally, all sizes of stone come to the primary jaw crusher (Blake-Marsden). The crushed product goes to a battery of special vibrating screens. From here the "oversize" goes to rolls for crushing and the remainder, by means of an elevator at the side of the material, is again carried to the top where it is thoroughly washed in Hardy & Padmore washers. Incidentally, the material is washed three times: first, as it is dredged, and the material is remarkably clean as it comes from the barges; then a spray of water meets the gravel as it reaches the three vibrating screens; and, finally, it is thoroughly washed in the washers themselves.

The screening equipment is especially interest-

*Reprinted from *Cement, Lime & Gravel.*

ing. It consists primarily of four vibrating screens (Huntington-Heberlein) :

One 8-ft. by 2-ft. double-deck screen to screen out ¾-in. and ½-in. material and pass ⅜-in. and down.

One 8-ft. by 1½-ft. single-deck screen to screen out ⅜-in. material and pass ¼-in. and down.

One 8-ft. by 1½-ft. single-deck screen to screen out ¼-in. material, and pass 3/16-in. material to the washer.

One 8-ft. by 1½-ft. single-deck screen to screen out ½-in. material.

This is a comparatively new type of screen which is said to give an extremely high efficiency, *i.e.*, about 96 to 97 per cent., and low power consumption—under 2 hp. per screen. There are no cams, hammers or eccentrics, wearing parts having been reduced to one replaceable gun-metal bushing in the pulley, and lubrication is effected at one point only. It consists of a steel-plate body holding the mesh surface mounted horizontally on flexible spring legs of laminated wooden strips.

In addition, there is one of the more orthodox-type vibrating screens, known as the Overstrom, measuring 6-ft. by 3-ft. to screen ¾-in. and down material. It is a non-electric vibratory, the driving mechanism consisting solely of an unbalanced pulley mounted above the mesh. It works at a speed of 1,700 r.p.m., giving an intense elliptical vibration, and requires from 2 to 3 hp. according to load.

Generally speaking, the plant is on orthodox lines, but it is remarkable for its compactness and convenient position. Although the firm has contracted for all gravel taken from the River Trent—and occasionally there is a peak of very heavy production—the storage facilities make it impossible for the inflow to be choked. If, by any reason, the 2,-500-ton rough-storage silo is full, the same crane can be used for dumping the excess material to storage under river water, whence it is reclaimed by a Gwynne 8-in. pump with a capacity of 100 tons of solids per hr.

The outlet for finished material is unusually good, it being possible to load on either side of the bins or at the center. On one side, the bin-gates are over the railway siding; on the other, over the barges by which means much material is shipped, the Trent being navigable, through locks and weirs, for barges up to 120 tons, all the way from Nottingham to Hull. In the middle are additional loading facilities for road transport. At present, most of the output is sent by rail and road in about equal proportions.

Altogether there are four separate crushing units, each consisting of a jaw crusher and rolls, of about 16-tons-per-hr. capacity. A similar unit has been replaced by the Kennedy crusher above mentioned, which does the work of both jaw crusher and rolls to such good effect that, for the time being, the superseded crushing unit has been shut down.

This Kennedy gyratory is doing very heavy duty and doing it remarkably well. In the first place, it has to deal with exceptionally hard gravel, and, secondly, the plant is run continuously in three shifts, only stopping for 2 hr. out of 24 for cleaning and adjustment. The log sheets reveal a steady output of 16 tons per hr. on this particular unit, which is the smallest Kennedy machine made. The machine is fed with clean washed gravel from 3-in. downwards,

Car-loading side of the concrete storage bins. Note chutes and bucket elevator.

Part of the casting and finishing shop where the cast stone is produced.

which is crushed in one operation to ¾-in. down.

The other two units are Symons cone crushers, fitted with coarse crushing members. These take a feed of 3 in. and less, giving 30 tons of minus ¾-in. chippings per hr. The outstanding features of these machines are the uniformity of the product, the large output, low horsepower consumption, and large range of reduction. The Symons crushers created quite a sensation when they were introduced into Britain about two years ago. The firm is installing a new gravel plant at Newark and is so delighted with the performance of the gyratory machine that the whole of the crushing operation at the new plant will be done by these machines. Many producers in England think that the crushed product of a gyratory tends to have too big a proportion of "flats," but Mr. Towle, the manager of the plant at Colwick, now says that his experience with the Kennedy proves this is not the case, and it is especially important to have a cubical product because a large proportion of the output is sold for chippings for tar spraying.

Incidentally, Trent Concrete, Ltd., was the first firm in the district to supply washed and crushed river gravel and sand, and, although competitors have sprung up, its business is growing steadily, due solely to clean, well-graded cubical products and prompt deliveries. To obtain the former no expense is spared, and the company prides itself in delivering whatever quantity a customer requires, and that any order received by 5 p. m. can be delivered by road the following morning, which necessitates carrying sufficiently large stocks to meet any emergency.

Apart from a large gravel business, the firm has well-equipped shops for concrete products and the manufacture of cast stone. Many of the best examples of cast stone in both public and private buildings in the district have been applied by them. The concrete products manufacture is kept entirely separate from the crushing and screening plant, although it adjoins the latter.

These shops are light and airy and constructed throughout of concrete. The mold-maker's shop especially is an object lesson in modern methods. It is equipped with the very latest Wadkin automatic woodworking machines, each with independent electric drive.

In addition the company makes the usual mass-production items such as curb, paving flag, and fencing posts. In the repetition-molding shop heavy capital expenditure has been incurred to insure large-scale production of thoroughly sound products on economical lines. A fractured curb showed consistency and density of material to be equal to that of natural stone and the outer surfaces and arrises were equally sound. No less than 250 Liner improved curb molds are in regular use. To strip these steel molds is the work of only a few moments. Six wing-nuts are slackened and the steel shape containing the cast curb slides out. Reassembly is just as simple: the steel shape is replaced and the wing-nuts tightened.

Production of Masonry, Natural and Puzzolan Cements in 1930

Statistics of hydraulic cements other than Portland cement—which include masonry, natural, and puzzolan cements—compiled by the U. S. Bureau of Mines, Department of Commerce, show a production of 1,792,083 barrels in 1930, which represents a decrease of 18.9 per cent. in comparison with 1929. In 1930 there were shipped from the mills 1,787,016 barrels of these cements, valued at $2,469,531, a decrease of over 17.2 per cent. in quantity and of 16.3 per cent. in gross value as compared with 1929. Stocks at the mills increased and were 2.6 per cent. higher at the end of 1930 than at the end of 1929.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

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F. A. BOEYE

Vice-President and General Sales-Manager
North American Cement Corp.
New York, N. Y.

Coming Events

Aug. 13, 1931. St. Louis, Mo. Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

Aug. 30-Sept. 4, 1931. Buffalo, N. Y. Eighty-second meeting, American Chemical Society, Hotel Statler.

Sept. 4, 5, 1931. Fresno, Cal. Regular meeting, California Associated Concrete Pipe Manufacturers, Hotel Fresno. A. A. Clark, secretary, Box 368, Visalia, Cal.

October 12-16, 1931. Chicago, Ill. National Safety Congress. W. H. Cameron, secretary, National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

Jan. 9-15, 1931. Detroit, Mich. Annual Convention and show, American Road Builders Assn. Chas. M. Upham, engineer-director, National Press Bldg., Washington, D. C.

Jan. 25-26, 1932. Pittsburgh, Pa. Annual convention, National Ready-Mixed Concrete Assn., Wm. Penn Hotel. V. P. Ahearn, executive secretary, Munsey Bldg., Washington, D. C.

Jan. 27-29, 1932. Pittsburgh, Pa. Annual convention, National Sand & Gravel Assn., Wm. Penn Hotel. V. P. Ahearn, secretary, Munsey Bldg., Washington, D. C.

Feb. 3-4, 1932. Washington, D. C. Annual meeting, Sand-Lime Brick Assn. Ellen Knight, sec., 321 N. Hamilton St., Saginaw, Mich.

Feb. 23-26, 1932. Washington, D. C. Annual convention, American Concrete Institute, Wardman Park Hotel. Harvey Whipple, sec., 2970 West Grand Blvd., Detroit, Mich.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These are printed in this column each issue.*

Fourteen Years Ago

THE Montezuma Gravel Co., capitalized at $12,000, established offices at Terre Haute, Ind., and announced plans for the early production of materials. Another new company incorporated was the Cazanovia Sand & Gravel Corp. of Elmira, N. Y., with $25,000 capital.

* * *

Because of poor business conditions, the Cement Products Exhibition Co., which had held an annual cement show at Chicago for several years, announced that the exhibit would be discontinued in the future.

Ten Years Ago

RECOVERY of sand from the bed of Lake Erie by two suction dredges of the Lake Erie Sand Co. of Sandusky, O., was described. Material was taken on about 25 miles from the shore, the dredges leaving each day at 4 a. m., returning in late afternoon when the sand was discharged to stone-piles at the shore plant. Deliveries were made by gondola cars, loading being accomplished by a clam-shell crane.

* * *

J. K. Davison & Co., important Pittsburgh sand-and-gravel producer, was preparing to launch a new electrically-operated dredge, the *Allegheny*. The dredge, of all-steel construction, was 164 ft. long, 45 ft. wide and 7½ ft. deep.

The Robinson Lime Co. of Winchester, Tenn., was formed with a capital of $250,000 to operate a plant for the production of lime. Arthur J. Robinson, W. S. Claiborne, and A. G. Ferris of Winchester were the incorporators.

Five Years Ago

O. L. MOORE, who had been an engineer in the inspection bureau of the Universal Portland Cement Co., was appointed engineer of tests by the Universal company. At that time, Mr. Moore had been connected with the company for twelve years.

* * *

The Hull plant of the Canada Cement Co. Ltd. was reopened after having been idle for several years.

* * *

The executive committee of the National Sand & Gravel Assn. met at Detroit and chose Cincinnati, O., as the place for the 1927 convention. V. P. Ahearn was appointed executive secretary.

* * *

The new plant of the Bakersfield Rock & Gravel Co. at Bakersfield, Cal., went into production, averaging 1,000 tons per day of material. Officers of the company were: A. H. Karpe, president; J. B. Dowd, vice-president; and C. F. Smith, secretary-treasurer.

Production of Asbestos Rises Sharply in 1930

The commercial production of asbestos (figures available for chrysotile only) in the United States in 1930 increased 84 per cent. in quantity, but declined 14 per cent. in total value, in comparison with 1929. With the exception of 1911, the 1930 production was the largest output of chrysotile ever recorded in the United States. According to figures compiled by the United States Bureau of Mines, from individual reports furnished by producers, the total quantity of chrysotile sold or used by producers in the United States in 1930 was 3,653 short tons, valued at $273,292, as compared with 1,983 tons, valued at $317,584, in 1929.

The total average value, per ton, of chrysotile in 1930, including all grades of crude and mill fiber, was $74.81. In 1929 the corresponding value was $160.15. The marked decline in average value in 1930 is partly accounted for by the decrease in production of high-grade crudes No. 1 and No. 2, mined only in Arizona, and by the increased production of the lower grades of mill fiber produced in Arizona, California, and Vermont.

New Corporations

ONTARIO CEMENT, LTD., Owen Sound, Ont., Can. 55,000 sh. n.p.v. To produce and deal in limestone, gypsum, clay, etc.

INDEPENDENT ROCK CO., LTD., Los Angeles, Cal. $200,000. H. C. Dorwin, G. J. Oppengard and W. L. Engelhardt.

ROCK SAND CO., Morristown, N. J. $125,000. King and Vogt, Morristown. To produce trap rock and stone.

MIXED-RITE-CONCRETE CORP., Schenectady, N. Y. 1,200 sh. common. E. E. Weber.

CANADIAN ROCKBESTOS, LTD., Montreal, Que.—New Corp. 10,500 class "A" shares and 12,500 class "B" shares, both no par value.

THE ARKANSAS ABRASIVE STONE CO., Little Rock, Ark., A. W. Taylor, Wallace Bldg., and others.

KINGSTON LAKE GRAVEL CO., 315-316 Durley Bldg., Bloomington, Ill. 20,000 shares n.p.v. To deal in gravel, sand, stone, etc. George N. Childs, Charles C. Riley and Ragna S. Solom.

THE ISLAND SAND & GRAVEL CO., Seattle, Wash. $50,000. J. C. Klinker, Nelson R. Anderson and others.

WONDERLAND MARL & HUMUS CORP., Michigan City, Ind. 500 shares at $100 each. To deal in marl, humus and other mineral substances. Joseph Peskin, Joseph Feldman and D. H. Feldman.

THE READY MIXED CONCRETE CORP., Roanoke, Va. $25,000 capital stock. Howard S. Rice, Salem, Va., and others.

Personal Mention

Frank Parsons of Salmon Creek, Wash., and **Z. M. Wilson** of Camas, Wash., have purchased the sand-and-gravel business of **A. T. Shere** at Vancouver, Wash.

O. S. Fletcher and **C. E. Stewart**, both of Eugene, Ore., are investigating the feasibility of installing a lime plant at the Black Butte mines, south of Cottage Grove, Ore., it is reported.

Charles S. Kanzig, formerly associated with the Manitowoc Portland Cement Co., Manitowoc, Wis., before its affiliation with the Medusa Portland Cement Co., has been made Chicago sales manager by the Medusa Company.

R. D. Bean, formerly manager of the Engineering development department of The Brown Instrument Co., Philadelphia, has been made chief engineer of that company.

Frank K. Billett, who has been connected with the Toledo Scale Co. for the past ten years, eight of which he has been head of the cost accounting department, has recently been appointed secretary of the company. Mr. Billett joined the organization as enameling-room clerk in 1920, and his recent appointment as secretary is a high tribute to his ten years of service.

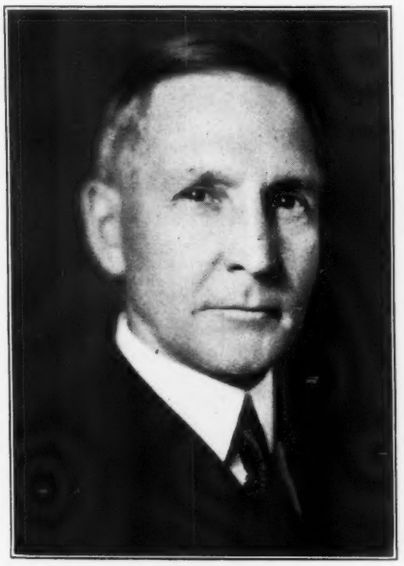
J. Passmore Elkinton, sales director, Philadelphia Quartz Co. and vice-president of the Philadelphia Quartz Co., of California, has just returned from a five months' trip to the Philippine Islands, China, Manchuria and Japan.

Roger W. Andrews, now assistant to A. C. Lehman, president of Blaw-Knox Co., has been appointed vice-president and a director of Blaw-Knox International Corp. Mr. Andrews will be in charge of the company's European activities.

George S. Cooper who has been connected with the Diamond Alkali Co., for several years in various capacities in the sales department has been appointed sales manager.

E. L. Kelzer, formerly district manager of the Owen Bucket Co. in the Detroit territory for the past five years, has been appointed in the same capacity to the Chicago territory, with offices at 840 W. Superior St., Chicago. **W. E. Phillips** has been appointed district manager of the Detroit territory, with offices in the General Motors Bldg.

E. H. Bruntlett, of Minneapolis, is now located at Morton, Minn., where he is engaged in work preparatory to opening up a granite quarry for the United Building Stone Co., of Minneapolis.



Sewell L. Avery.

Sewell L. Avery, president of the United States Gypsum Co. of Chicago, has been elected a director of the United States Steel Corp. Mr. Avery is also a director of Armour & Co. and the Continental Illinois Bank & Trust Co.

Ellsworth L. Mills, formerly sales manager for the Bastian-Blessing Co., maker of welding equipment, Milwaukee, has been elected vice-president of the company and continues in charge of sales. Mr. Mills has been identified with the welding industry since his graduation from Cooper Union Institute.

W. B. Pine, Okmulgee, Okla., formerly United States Senator, and **R. D. Pine**, also of Okmulgee, have arranged for the purchase of the plant of Interstate Window Glass Co. at Okmulgee and plan to remodel the plant. They have also secured an option on about 300 acres of dolomite properties in the Arbuckle Mountain district, near Bromide, Okla., and plan to develop the raw material for glass manufacture. **Robert M. Isham**, Okmulgee, chemical engineer, is consulting engineer for the Pine interests.

Guy M. Beaty, Charlotte, N. C., has organized the Guy M. Beaty Roofing Co., with capital of $50,000, and plans the operation of plant to utilize nonmetallic minerals in the manufacture of roofing and kindred products.

J. E. Jellick of the Calaveras Cement Co. addressed the Kiwanis Club of Vallejo, Cal., recently describing the operations of a modern cement plant. Moving pictures accompanied the talk. Mr. Jellick formerly managed the Los Angeles office of the Portland Cement Assn.

J. Nicholson, Goodrich, Ont., Can., is rebuilding a hydraulic dredge, and is about to install a gravel handling plant.

Obituary

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Coming Events

Aug. 13, 1931. St. Louis, Mo. Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

Aug. 30-Sept. 4, 1931. Buffalo, N. Y. Eighty-second meeting, American Chemical Society, Hotel Statler.

Sept. 4, 5, 1931. Fresno, Cal. Regular meeting, California Associated Concrete Pipe Manufacturers, Hotel Fresno. A. A. Clark, secretary, Box 368, Visalia, Cal.

October 12-16, 1931. Chicago, Ill. National Safety Congress. W. H. Cameron, secretary, National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

Jan. 9-15, 1931. Detroit, Mich. Annual Convention and show, American Road Builders Assn. Chas. M. Upham, engineer-director, National Press Bldg., Washington, D. C.

Jan. 25-26, 1932. Pittsburgh, Pa. Annual convention, National Ready-Mixed Concrete Assn., Wm. Penn Hotel. V. P. Ahearn, executive secretary, Munsey Bldg., Washington, D. C.

Jan. 27-29, 1932. Pittsburgh, Pa. Annual convention, National Sand & Gravel Assn., Wm. Penn Hotel. V. P. Ahearn, secretary, Munsey Bldg., Washington, D. C.

Feb. 3-4, 1932. Washington, D. C. Annual meeting, Sand-Lime Brick Assn. Ellen Knight, sec., 321 N. Hamilton St., Saginaw, Mich.

Feb. 23-26, 1932. Washington, D. C. Annual convention, American Concrete Institute, Wardman Park Hotel. Harvey Whipple, sec., 2970 West Grand Blvd., Detroit, Mich.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These are printed in this column each issue.*

Fourteen Years Ago

THE Montezuma Gravel Co., capitalized at $12,000, established offices at Terre Haute, Ind., and announced plans for the early production of materials. Another new company incorporated was the Cazanovia Sand & Gravel Corp. of Elmira, N. Y., with $25,000 capital.

* * *

Because of poor business conditions, the Cement Products Exhibition Co., which had held an annual cement show at Chicago for several years, announced that the exhibit would be discontinued in the future.

Ten Years Ago

RECOVERY of sand from the bed of Lake Erie by two suction dredges of the Lake Erie Sand Co. of Sandusky, O., was described. Material was taken on about 25 miles from the shore, the dredges leaving each day at 4 a. m., returning in late afternoon when the sand was discharged to stone-piles at the shore plant. Deliveries were made by gondola cars, loading being accomplished by a clam-shell crane.

* * *

J. K. Davison & Co., important Pittsburgh sand-and-gravel producer, was preparing to launch a new electrically-operated dredge, the *Allegheny*. The dredge, of all-steel construction, was 164 ft. long, 45 ft. wide and 7½ ft. deep.

The Robinson Lime Co. of Winchester, Tenn., was formed with a capital of $250,000 to operate a plant for the production of lime. Arthur J. Robinson, W. S. Claiborne, and A. G. Ferris of Winchester were the incorporators.

Five Years Ago

O. L. MOORE, who had been an engineer in the inspection bureau of the Universal Portland Cement Co., was appointed engineer of tests by the Universal company. At that time, Mr. Moore had been connected with the company for twelve years.

* * *

The Hull plant of the Canada Cement Co. Ltd. was reopened after having been idle for several years.

* * *

The executive committee of the National Sand & Gravel Assn. met at Detroit and chose Cincinnati, O., as the place for the 1927 convention. V. P. Ahearn was appointed executive secretary.

* * *

The new plant of the Bakersfield Rock & Gravel Co. at Bakersfield, Cal., went into production, averaging 1,000 tons per day of material. Officers of the company were: A. H. Karpe, president; J. B. Dowd, vice-president; and C. F. Smith, secretary-treasurer.

Production of Asbestos Rises Sharply in 1930

The commercial production of asbestos (figures available for chrysotile only) in the United States in 1930 increased 84 per cent. in quantity, but declined 14 per cent. in total value, in comparison with 1929. With the exception of 1911, the 1930 production was the largest output of chrysotile ever recorded in the United States. According to figures compiled by the United States Bureau of Mines, from individual reports furnished by producers, the total quantity of chrysotile sold or used by producers in the United States in 1930 was 3,653 short tons, valued at $273,292, as compared with 1,983 tons, valued at $317,584, in 1929.

The total average value, per ton, of chrysotile in 1930, including all grades of crude and mill fiber, was $74.81. In 1929 the corresponding value was $160.15. The marked decline in average value in 1930 is partly accounted for by the decrease in production of high-grade crudes No. 1 and No. 2, mined only in Arizona, and by the increased production of the lower grades of mill fiber produced in Arizona, California, and Vermont.

New Corporations

ONTARIO CEMENT, LTD., Owen Sound, Ont., Can. 55,000 sh. n.p.v. To produce and deal in limestone, gypsum, clay, etc.

INDEPENDENT ROCK CO., LTD., Los Angeles, Cal. $200,000. H. C. Dorwin, G. J. Oppengard and W. L. Engelhardt.

ROCK SAND CO., Morristown, N. J. $125,000. King and Vogt, Morristown. To produce trap rock and stone.

MIXED-RITE-CONCRETE CORP., Schenectady, N. Y. 1,200 sh. common. E. E. Weber.

CANADIAN ROCKBESTOS, LTD., Montreal, Que.—New Corp. 10,500 class "A" shares and 12,500 class "B" shares, both no par value.

THE ARKANSAS ABRASIVE STONE CO., Little Rock, Ark., A. W. Taylor, Wallace Bldg., and others.

KINGSTON LAKE GRAVEL CO., 315-316 Durley Bldg., Bloomington, Ill. 20,000 shares n.p.v. To deal in gravel, sand, stone, etc. George N. Childs, Charles C. Riley and Ragna S. Solom.

THE ISLAND SAND & GRAVEL CO., Seattle, Wash. $50,000. J. C. Klinker, Nelson R. Anderson and others.

WONDERLAND MARL & HUMUS CORP., Michigan City, Ind. 500 shares at $100 each. To deal in marl, humus and other mineral substances. Joseph Peskin, Joseph Feldman and D. H. Feldman.

THE READY MIXED CONCRETE CORP., Roanoke, Va. $25,000 capital stock. Howard S. Rice, Salem, Va., and others.

Personal Mention

Frank Parsons of Salmon Creek, Wash., and **Z. M. Wilson** of Camas, Wash., have purchased the sand-and-gravel business of **A. T. Shere** at Vancouver, Wash.

O. S. Fletcher and **C. E. Stewart**, both of Eugene, Ore., are investigating the feasibility of installing a lime plant at the Black Butte mines, south of Cottage Grove, Ore., it is reported.

Charles S. Kanzig, formerly associated with the Manitowoc Portland Cement Co., Manitowoc, Wis., before its affiliation with the Medusa Portland Cement Co., has been made Chicago sales manager by the Medusa Company.

R. D. Bean, formerly manager of the Engineering development department of The Brown Instrument Co., Philadelphia, has been made chief engineer of that company.

Frank K. Billett, who has been connected with the Toledo Scale Co. for the past ten years, eight of which he has been head of the cost accounting department, has recently been appointed secretary of the company. Mr. Billett joined the organization as enameling-room clerk in 1920, and his recent appointment as secretary is a high tribute to his ten years of service.

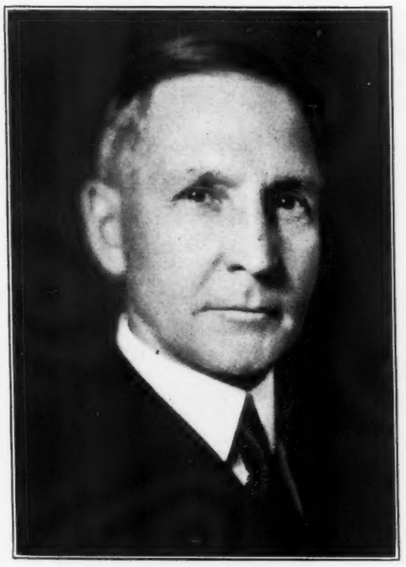
J. Passmore Elkinton, sales director, Philadelphia Quartz Co. and vice-president of the Philadelphia Quartz Co., of California, has just returned from a five months' trip to the Philippine Islands, China, Manchuria and Japan.

Roger W. Andrews, now assistant to A. C. Lehman, president of Blaw-Knox Co., has been appointed vice-president and a director of Blaw-Knox International Corp. Mr. Andrews will be in charge of the company's European activities.

George S. Cooper who has been connected with the Diamond Alkali Co., for several years in various capacities in the sales department has been appointed sales manager.

E. L. Kelzer, formerly district manager of the Owen Bucket Co. in the Detroit territory for the past five years, has been appointed in the same capacity to the Chicago territory, with offices at 840 W. Superior St., Chicago. **W. E. Phillips** has been appointed district manager of the Detroit territory, with offices in the General Motors Bldg.

E. H. Bruntlett, of Minneapolis, is now located at Morton, Minn., where he is engaged in work preparatory to opening up a granite quarry for the United Building Stone Co., of Minneapolis.



Sewell L. Avery.

Sewell L. Avery, president of the United States Gypsum Co. of Chicago, has been elected a director of the United States Steel Corp. Mr. Avery is also a director of Armour & Co. and the Continental Illinois Bank & Trust Co.

Ellsworth L. Mills, formerly sales manager for the Bastian-Blessing Co., maker of welding equipment, Milwaukee, has been elected vice-president of the company and continues in charge of sales. Mr. Mills has been identified with the welding industry since his graduation from Cooper Union Institute.

W. B. Pine, Okmulgee, Okla., formerly United States Senator, and **R. D. Pine**, also of Okmulgee, have arranged for the purchase of the plant of Interstate Window Glass Co. at Okmulgee and plan to remodel the plant. They have also secured an option on about 300 acres of dolomite properties in the Arbuckle Mountain district, near Bromide, Okla., and plan to develop the raw material for glass manufacture. **Robert M. Isham**, Okmulgee, chemical engineer, is consulting engineer for the Pine interests.

Guy M. Beaty, Charlotte, N. C., has organized the Guy M. Beaty Roofing Co., with capital of $50,000, and plans the operation of plant to utilize nonmetallic minerals in the manufacture of roofing and kindred products.

J. E. Jellick of the Calaveras Cement Co. addressed the Kiwanis Club of Vallejo, Cal., recently describing the operations of a modern cement plant. Moving pictures accompanied the talk. Mr. Jellick formerly managed the Los Angeles office of the Portland Cement Assn.

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Latest Portland-Cement Statistics

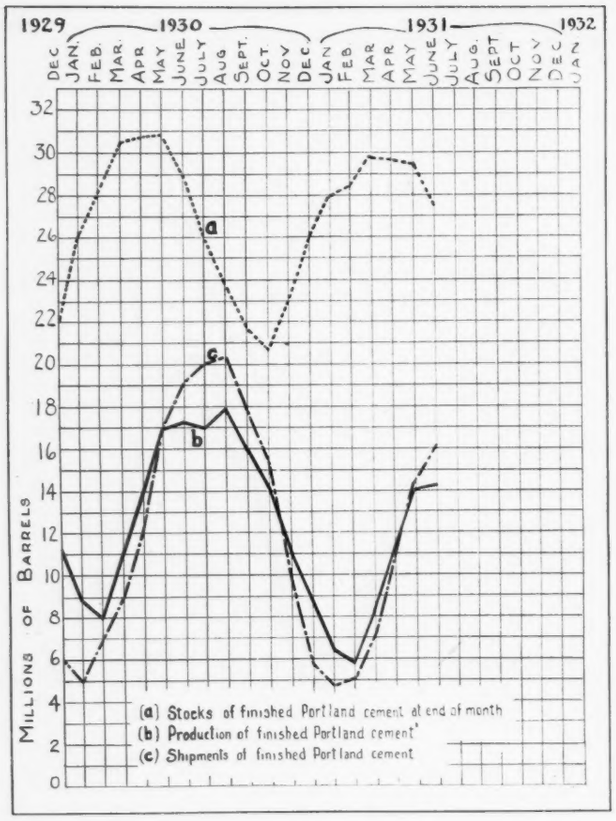

Chart showing production, shipments and stocks on hand, by months, from December, 1929, to June, 1931.

THE Portland-cement industry in June, 1931, produced 14,125,000 barrels, shipped 16,094,000 barrels from the mills, and had in stock at the end of the month 27,585,000 barrels. Production of Portland cement in June, 1931, showed a decrease of 18.1 per cent. and shipments a decrease of 14.3 per cent., as compared with June, 1930. Portland-cement stocks at the mills were 6.1 per cent. lower than a year ago. The total production for the first half of 1931 amounts to 60,140,000 barrels, compared with 75,894,000 barrels in the same period of 1930, and the total shipments for the first half of 1931 amount to 58,436,000 barrels, compared with 70,138,000 barrels in the same period of 1930.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN MAY, 1931

Exported to—	Barrels	Value
Canada	4,489	$16,280
Central America	11,649	23,571
Cuba	2,919	7,722
Other West Indies and Bermuda	4,607	7,635
Mexico	5,414	18,577
South America	16,190	51,799
Other Countries	2,760	15,369
Total	48,028	$140,953

DISTRIBUTION OF CEMENT

Shipped to—	April		May	
	1930	1931	1930	1931
Alabama	126,501	219,593	129,594	183,572
Alaska	2,988	1,153	2,068	946
Arizona	45,312	47,083	41,429	42,631
Arkansas	130,247	183,121	131,701	187,370
California	823,295	653,624	876,467	628,900
Colorado	85,644	70,204	109,098	124,139
Connecticut	184,816	150,380	211,543	176,666
Delaware	32,573	32,856	38,168	47,276
District of Columbia	82,913	119,153	96,091	130,588
Florida	104,898	61,526	104,418	82,852
Georgia	139,155	182,817	135,715	156,532
Hawaii	26,240	20,849	29,558	25,580
Idaho	25,650	21,558	22,081	19,917
Illinois	694,367	717,468	1,038,904	882,730
Indiana	386,945	256,697	637,605	411,373
Iowa	447,570	309,768	1,067,232	611,996
Kansas	283,917	184,369	270,178	328,414
Kentucky	118,156	197,013	122,507	231,958
Louisiana	374,620	277,366	311,868	314,748
Maine	64,470	36,091	79,871	54,690
Maryland	257,033	181,752	331,582	199,360
Massachusetts	320,443	279,032	325,910	323,576
Michigan	599,371	395,559	1,022,121	659,977
Minnesota	248,088	268,765	501,896	468,010
Mississippi	42,812	53,159	44,775	82,827
Missouri	529,829	406,831	734,806	511,513
Montana	37,562	24,187	37,558	30,139
Nebraska	153,348	131,416	164,983	237,284
Nevada	15,637	11,722	15,133	10,999
New Hampshire	45,594	30,884	66,250	42,169
New Jersey	623,867	484,331	712,665	557,649
New Mexico	35,730	30,751	32,693	42,604
New York	1,556,095	1,527,913	2,032,025	2,013,197
North Carolina	141,565	123,303	133,974	146,249
North Dakota	39,253	35,616	43,316	43,024
Ohio	823,451	491,647	1,091,994	668,196
Oklahoma	381,939	244,250	364,053	301,925
Oregon	72,861	105,653	89,175	104,620
Pennsylvania	1,088,646	697,081	1,559,467	801,763
Porto Rico	1,300	2,825	5,265	3,905
Rhode Island	73,396	73,310	87,710	81,320
South Carolina	81,105	234,756	80,910	256,625
South Dakota	36,414	56,775	51,745	77,241
Tennessee	236,120	151,183	229,121	158,104
Texas	713,051	524,419	583,004	597,840
Utah	53,292	31,633	54,023	30,513
Vermont	32,457	22,391	55,676	24,529
Virginia	148,622	162,050	182,283	183,752
Washington	276,475	211,323	324,551	276,386
West Virginia	120,687	92,214	175,547	128,383
Wisconsin	299,210	288,648	564,324	431,564
Wyoming	15,870	13,920	18,818	17,243
Unspecified	14,500	19,876	13,660	12,082
	13,295,900	11,151,864	17,187,109	14,167,458
Foreign countries	44,100	32,136	36,891	32,542
Total shipped from cement plants	13,340,000	11,184,000	17,224,000	14,200,000

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN MAY, 1931

Imported from—	District into which imported	Barrels	Value
Belgium	Florida	604	$990
	Porto Rico	1,011	2,400
	Total	1,615	3,390
Canada	Maine and New Hampshire	30	89
Denmark	Porto Rico	10,534	8,722
France	New York	741	2,236
Japan	Hawaii	1,276	1,033
Yugoslavia	Philadelphia	5,865	7,324
	Grand total	20,061	$22,794

RELATION OF PRODUCTION TO CAPACITY

	June		May	April	March
	1930 (*per cent.*)	1931 (*per cent.*)	1931 (*per cent.*)	1931 (*per cent.*)	1931 (*per cent.*)
The month	81.4	65.4	62.8	52.1	36.9
The 12 months ended	66.4	55.2	56.5	57.7	58.6

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1930 AND 1931 (*In thousands of barrels*)

Month	Production		Shipments		Stocks at End of Month	
	1930	1931	1930	1931	1930	1931
January	8,498	6,595	4,955	4,692	27,081	27,759
February	8,162	5,920	7,012	5,074	28,249	28,612
March	11,225	8,245	8,826	7,192	30,648	29,676
April	13,521	11,245	13,340	11,184	30,867	29 715
May	17,249	14,010	17,224	14,200	30,891	29,554
June	17,239	14,125	18,781	16,094	29,364	27,585
July	17,078	.....	20,153	.....	26,289	.....
August	17,821	.....	20,299	.....	23,824	.....
September	16,124	.....	18,083	.....	21,889	.....
October	14,410	.....	15,599	.....	20,697	.....
November	11,098	.....	8,784	.....	23,056	.....
December	8,480	.....	5,688	.....	25,883	.....
Totals	160,905	.....	158,744	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS, in JUNE 1930 and 1931 (*In thousands of barrels*)

District	Production		Stocks at End of Month	
	1930	1931	1930	1931
Eastern Pa., N. J., and Md	3,270	2,660	2,259	1,731
New York and Maine	1,123	1,021	849	1,212
Ohio, Western Pa., and W. Va	1,854	1,271	1,705	1,402
Michigan	1,241	623	1,613	1,387
Wis., Ill., Ind., and Ky	2,099	1,533	2,316	1,490
Va., Tenn., Ala., Ga., Fla., and La	1,222	1,274	980	709
Eastern Mo., Ia., Minn., and S. Dak	1,776	1,145	1,037	930
W. Mo., Neb., Kans., Okla., and Ark	1,282	1,143	417	695
Texas	485	702	315	270
Colo., Mont., Utah, Wyo., and Idaho	321	297	206	280
California	899	755	1,231	1,356
Oreg. and Wash	323	256	524	339
Totals	15,895	12,680	13,452	11,801

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN JUNE 1930 AND 1931, AND STOCKS IN MAY, 1931 (*In thousands of barrels*)

District	June						Stocks at End of May 1931
	Production		Shipments		Stocks at End of Month		
	1930	1931	1930	1931	1930	1931	
Eastern Pa., N. J., and Md	3,397	2,900	3,903	3,260	6,513	6,464	6,824
New York and Maine	1,271	1,230	1,381	1,360	1,737	1,914	2,044
Ohio, Western Pa., and W. Va	1,924	1,505	2,119	1,507	3,908	3,511	3,513
Michigan	1,487	920	1,459	1,030	2,812	2,371	2,482
Wis., Ill., Ind., and Ky	2,336	1,757	2,552	2,220	4,591	3,916	4,378
Va., Tenn., Ala., Ga., Fla., and La	1,316	1,312	1,180	1,463	2,001	1,479	1,630
Eastern Mo., Ia., Minn., and S. Dak	1,987	1,300	2,412	1,918	3,203	3,244	3,862
W. Mo., Neb., Kans., Okla., and Ark	1,322	1,187	1,404	1,303	1,725	1,710	1,826
Texas	558	634	706	693	688	675	734
Colo., Mont., Utah, Wyo., and Idaho	300	298	296	278	562	629	609
California	955	751	951	753	1,080	1,101	1,103
Oreg. and Wash	386	331	418	309	544	571	549
Totals	17,239	14,125	18,781	16,094	29,364	27,585	29,554

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1930 AND 1931

Month	Exports				Imports			
	1930		1931		1930		1931	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	82,387	$293,135	41,199	$115,678	201,609	$207,461	97,057	$132,937
February	64,267	217,798	25,703	88,989	114,455	119,717	22,370	26,250
March	117,563	357,896	54,599	144,579	43,622	59,981	70,532	80,686
April	57,419	200,217	40,478	116,564	140,871	178,226	54,717	61,728
May	57,423	198,170	48,028	140,953	94,696	111,998	20,061	22,794
June	82,077	223,639	.....	.....	55,356	74,370	.....	.....
July	47,082	166,577	.....	.....	12,404	20,973	.....	.....
August	49,031	167,579	.....	.....	35,323	39,029	.....	.....
September	46,594	153,384	.....	.....	51,096	59,721	.....	.....
October	62,690	190,305	.....	.....	75,284	84,364	.....	.....
November	50,495	151,555	.....	.....	109,124	125,448	.....	.....
December	38,680	134,260	.....	.....	44,157	59,641	.....	.....
Totals	755,708	2,454,515	.....	.....	977,997	1,140,929	.....	.....

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1930 AND 1931 (*In thousands of barrels*)

Month	Production		Stocks End of Month		Month	Production		Stocks End of Month	
	1930	1931	1930	1931		1930	1931	1930	1931
January	10,504	8,129	9,646	10,384	July	15,069	.....	11,684	.....
February	10,008	7,473	11,572	11,946	August	15,244	.....	9,275	.....
March	13,045	9,586	13,503	13,318	September	14,577	.....	7,783	.....
April	15,025	11,540	15,164	13,854	October	13,895	.....	7,266	.....
May	16,607	13,159	14,668	13,087	November	11,639	.....	7,758	.....
June	15,895	12,680	13,452	11,801	December	9,484	.....	8,809	.....

Sues Amtorg for Breach of Uralasbest Contract

Walter A. Rukeyser, who for a considerable period was chief consultant to Uralasbest, Russian asbestos-mining trust, has brought action against the Amtorg Trading Corp., the commercial representative of the U. S. S. R. in the United States.

Mr. Rukeyser's suit charges conspiracy to bring about a breach of his contract with Uralasbest (calling for $60,000 for two years' work) and conspiracy to steal patents, processes, and ideas. The contract, signed with Amtorg, Mr. Rukeyser maintains, was to run from June 17, 1930, to July 16, 1932. In December, 1930, it was abrogated, after he had received $18,000. In addition to the $42,000 he declares is due him in accordance with the contract, Mr. Rukeyser is asking for $208,000 for damage resulting from the loss of professional reputation because of false and slanderous statements alleged to have been disseminated.

The Amtorg Trading Corp. replied to the charges by stating that the agreement under which Mr. Rukeyser was working specified a method by which it could be annulled and that, after nine months, Uralasbest informed Mr. Rukeyser that in view of unsatisfactory services and non-fulfillment of certain points of the agreement, his services were no longer required. Mr. Rukeyser, the Amtorg Corp. declares, never made any claims in the manner provided for in the agreement. It disclaims, furthermore, having had any participation in the actual contract preparation.

Traffic News and Comment

Recent I. C. C. Decisions

Asphaltic Road-Building Materials.—Another mileage scale has been added to the list of scales prescribed by the Commission. This scale is to be used in making rates on crushed, broken or ground limestone containing no more than 6 per cent. of asphalt, from Margrum and Cherokee, Ala., and on asphalt rock, natural or coated, with not to exceed 5 per cent. of road oil, crushed or ground, and on stone coated with not to exceed 5 per cent. of road oil, from Cline and Blewett, Tex., to destinations in the southwest. Permission was given the defendants to establish the same basis from Dabney and White Mines, Tex., and to blanket the rates from Blewett, Cline, Dabney and White Mines, applying from all the quarries the lowest rate applicable under the scales prescribed from any of them. Rates from the Alabama points were found to be unreasonable to the extent that they exceeded the scale and reparation was awarded. No justification was found for the thirteenth-section complaint against Texas intrastate rates. The carload minimum weight is to be 90 per cent. of the marked capacity of the car. Rates at various points on the scales for single and joint movements are shown below. I. C. C. Docket No. 23,094, Alabama Rock Asphalt Co., Inc., *v.* A. & S. *et al.*, and Sub. 1, Uvalde Rock Asphalt Co. *v.* A. G. S. *et al.*

Miles	Single	Joint
10	$0.70	$0.90
50	1.05	1.25
100	1.30	1.45
150	1.55	1.65
200	1.80	2.00
350	2.35	2.45
500	2.85	2.85
650	3.30	3.30
800	3.80	3.80

Sulphur.—The rates on crude sulphur from points in Texas to Meridian, Miss., have been found not unreasonable. The rate on the same commodity from points in Texas to Hattiesburg, Miss., prior to Sept. 28, 1930, was unreasonable to the extent that it exceeded the combination based on New Orleans, La., and reparation was awarded. I. C. C. Docket No. 23,467, Meridian Fertilizer Factory *v.* G. C. & S. F. *et al.*

Fourth-Section Relief

Amiesite.—Fourth-section relief has been granted the carriers who were defendants in I. C. C. Docket No. 22,598, Interstate Amiesite Co. *v.* A. C. & Y. *et al.*, in the establishment of rates on Amiesite (crushed stone or slag coated with oil, tar or asphaltum), as ordered by the Commission in that case. F. S. O. No. 10,618.

Fourth-Section Applications

Commodities.—J. E. Tilford, agent, is requesting authority to make changes in commodity rates within, from and to points in Southern territory, occurring in the ordinary course of business, with observing the provisions of the fourth section of the act. F. S. A. No. 14,416.

Rate-Committee Dockets

Trunk Line Assn.

Cement.—Carriers propose to increase the rate 2 cents per 100 lb., over the scale rate shown in I. C. C. Docket 15,806, on cement from all Trunk-line producing points to all destinations in Virginia on the Valley R. R. Docket No. 27,168, Supp. 1.

Crushed Stone.—Shippers have asked that the rate on crushed stone,[1] from Bound Rock, N. J., to Plainfield, N. J., be reduced from 60 cents to 40 cents a net ton to meet motor-truck competition. Docket No. 27,432.

Central Freight Assn.

Crushed Stone.—Reduced rates on crushed stone, limestone, screenings and agricultural limestone in bulk in open-top cars,[1] are proposed by shippers at Holland, O., to apply to destinations on the Ohio Division of the N. Y. C. Representative rates in Docket No. 28,921 are:

To	Proposed	Present
Lime City, O.	$0.60	$0.65
Dunbridge, O.	.65	.80
Bowling Green, O.	.70	.80
Mermill, O.	.75	.80
Galatea, O.	.80	.90
Findlay, O.	.85	.90
Arlington, O.	.90	1.00
Dunkirk, O.	.95	1.00
New Reigel, O.	.85	.90

Crushed Stone, Sand and Gravel.—Shippers propose that the rate on sand and gravel,[1] from Kenneth and Lake Ciecott, Ind., to Haskells, Ind., and the rate on crushed stone and related commodities,[1] from Kenneth, Ind., to Haskells, Ind., be reduced from $1.05 to 95 cents a net ton. Docket No. 28,933.

Mortar.—Shippers at Carey, O., have asked for reduced rates on dry building mortar consisting of a mixture of Portland cement, lime and/or ground slag, carlot minimum weight 30,000 lb., to destinations on the Md. & Pa. R. R. Representative rates are shown below. Docket No. 28,923.

To	Proposed	Present
Baldwin, Md.	$0.25	$0.335
Bel Air, Md.	.265	.35
Notre Dame, Md.	.235	.275
Towson, Md.	.235	.30
Castle Fin, Pa.	.28	.35
Reed Lion, Pa.	.235	.24
South Side, Pa.	.265	.335

Roasted Dolomite.—Shippers at Narlo, O., propose the establishment of a rate of $2.75 a net ton (50 per cent. of 6th Class) on roasted or burned dolomite[1] to Bettendorf, Ia. The present rate is $3.30 a net ton (60 per cent. of 6th Class). Docket No. 28,983.

A reduction in the rate on roasted dolomite,[1] from Bettsville, Maple Grove and Woodville, O., to Peoria, Ill., from $2.90 to $2.34 a net ton is requested by shippers. Docket No. 29,010.

Sand.—Reductions in the rates on sand (all kinds) from Newark, O., to destinations on the B. & O., of 5 or 10 cents have been proposed by shippers. Representative rates in Docket No. 28,931, are,

To	Proposed	Present
Willard, O.	$1.00	$1.10
Shelby, O.	.95	1.00
Lexington, O.	.85	.90
Butler, O.	.80	.90
Mt. Vernon, O.	.65	.70
Summit, O.	.60	.70
Carthon, O.	.70	.80
Zanesville, O.	.65	.70
New Concord, O.	.80	.90
Barnesville, O.	1.00	1.10
Malta, O.	.85	.90

Shippers of refuse foundry sand at Muncie, Ind., propose a reduction in the rate on that commodity, carload minimum weight 50,000 lb., to Indianapolis, Ind., from $1.40 to 95 cents a net ton. Docket No. 29,009.

Carriers propose to reduce the rates on sand (blast, engine, fire, foundry, glass, molding or silica), from Millington, Oregon, Ottawa, Sheridan and Utica, Ill., to Rochester, N. Y., from $4.83 to $4.63 a net ton, and to E. Rochester, N. Y., from $4.91 to $4.63 a net ton. Docket No. 29,013.

Western Trunk Line Committee

Crushed Stone, Sand and Gravel.—Carriers propose to correct the rules governing furnishing of cars of different size than ordered in so far as this applies to sand, gravel, crushed or ground stone and agricultural limestone, between all points in W. T. L. territory, so that these rules will not apply when cars of less than 60,000 lb. capacity are ordered. Docket No. 6,146-K.

Lime.—It is proposed to reduce the rate on lime, carload minimum weight 30,000 lb., from Francis Creek, Wis., to Anderson, Ind., from 30½ to 17 cents per 100 lb. Docket No. 3,294-A.

It is proposed to publish commodity rates on lime carload minimum weight 30,000 lb., from Green Bay, Wis., to various destinations in Indiana, Michigan and Ohio as shown in C. & N. W. Tariff 12,118-D, same as now in effect from Oshkosh, Francis Creek and Sheboygan, Wis. At present sixth class rates apply. Docket No. 3,294-B.

Feldspar.—A reduction in the rate on feldspar, carload minimum weight 50,000 lb., from Erwin, Tenn., to Charlotte, N. C., from $6.00 to $2.50 a net ton is proposed by shippers. Docket No. 55,636.

Southern Freight Assn.

Ground Limestone.—Shippers of ground limestone at Maymead and Shouns, Tenn., propose a reduction in the rate on that commodity, carload minimum weight 60,000 lb., to Boone, N. C., from $2.40 to $2.00 a net ton. Docket No. 55,565.

In the revision of rates on ground or pulverized limestone intraterritorially between points in Southern territory it is proposed to use the following commodity descriptions: Limestone or marble (except bituminous rock, asphaltic limestone, bituminous asphalt rock, phosphate rock of gypsum), crushed, granulated, ground or pulverized to fineness to pass a screen of 5/16-inch mesh, including stone dust, in bulk or in bulk in bags, carload minimum weight 60,000 lb. Stone, marble or granite (except bituminous rock, asphaltic limestone, bituminous asphalt rock, phosphate rock, soapstone or gypsum), crushed, ground, granulated or pulverized, including stone dust, in bulk in bags, carload minimum weight 60,000 lb. Limestone or marble chips (terrazzo aggregate) in bulk, or in bulk in bags or barrels, carload minimum weight 60,000 lb. Slate, crushed, ground or pulverized, in bulk, or in bulk in bags, carload minimum weight 60,000 lb. Slag granules (except ground basic slag), in bulk or in bulk in bags, carload minimum weight 60,000 lb. Docket No. 55,246, Amendment 2.

Mica.—Carriers propose to cancel the through rate on scrap mica, carload minimum weight 30,000 lb., from Ridgeway and Rocky Mount, Va., to Chicago and Chicago Heights, Ill., of $9.36 a net ton, and allow the combination rate of $6.00 a net ton to apply. Docket No. 55,611.

Southwestern Freight Bureau

Amiesite.—Shippers of crushed stone coated with oil tar or asphaltum, at Des Moines, Ia., are asking for the publication of rates on that commodity,[1] within a radius of 400 mi., based on the following mileage scale for single-line haul, with the addition of 25 cents per net ton for joint hauls. Rates shown are per net ton. Docket No. 23,190.

Miles	Rate	Miles	Rate
10	$0.96	200	$1.99
25	.96	225	2.11
40	1.07	250	2.22
60	1.19	275	2.34
75	1.30	300	2.57
100	1.42	325	2.68
125	1.53	350	2.80
150	1.76	375	2.91
175	1.88	400	3.03

Crushed Stone.—Shippers propose the establishment of a rate of $1.10 a net ton on crushed stone,[1] including riprap in pieces ranging up to 200 lb., from Pilot Knob, Bushburg, Glen Park, Horine, Iron Mountain, Kimmswick, Lopez, Middlebrook and Silicia, Mo., to E. St. Louis, Ill., to apply only on deliveries on the A. & S. or T. R. R. A. Docket No. 23,178.

Lime.—Carriers propose to establish on lime, as described in St. L.-S. F. Tariff 69-L, carload minimum weight 30,000 lb., from groups 1 and 2 shown below, a rate of 35 cents to Keyes, Okla., on the B. M. & E., and to B. M. & E. stations, viz., Hovey, Tracy, Eva and Burton, Okla., a rate of 34 cents from group 1 and 36 cents per 100 lb. from group 2. Group 1 points are: Ash Grove, Galloway, Osceola, Pierce City and Springfield, Mo. Group 2 point is Johnsons, Ark. Docket No. 23,172.

Carriers propose to establish a rate of 46½ cents per 100 lb., on lime, carload, from stations named under column 11, page 143 S.W.L. Tariff 26-X, and a rate of 47 cents per 100 lb., on lime in mixed carloads with plaster as described from origins named under column 12, page 143 of S.W.L. Tariff 26-X, to M. B. & E. stations, viz., Hovey, Eva, Tracy, Burton, Hopkins, Doolin and Keyes, Okla. Docket No. 23,195.

Trans-Continental Freight Bureau

Magnesite.—Shippers request that Tariff 37-B be amended to provide for a carload rate of $10.00 per ton on magnesite, carload minimum weight 80,000 lb., from Livermore, Cal., to Upton, Wyo. Docket No. 12,572.

FORECASTS OF MINERAL PRODUCERS' CAR REQUIREMENTS

Board	Stone—Sand—Gravel			Cement			Lime—Plaster		
	Actual 1930	Estimate 1931	%	Actual 1930	Estimate 1931	%	Actual 1930	Estimate 1931	%
New England	18,220	16,398	10.0	5,473	5,364	2.0	3,060	2,754	10.0
Atlantic States	97,191	88,347	9.1	63,737	50,990	20.0	8,524	7,475	12.3
Allegheny	64,428	51,027	20.8	16,912	13,360	21.0	3,284	2,854	13.1
Great Lakes	89,378	60,000	32.9	16,906	14,500	14.2	13,029	12,500	4.1
Ohio Valley	69,432	64,086	7.7	15,604	15,604	.....	1,672	1,672	.....
Mid-West	197,979	128,700	35.0	41,659	35,870	13.9	3,526	2,469	30.0
Northwest	26,256	26,256	.....	7,954	6,522	18.0	475	351	26.1
Trans.-Mo.-Kans	78,313	78,313	.....	24,461	21,281	13.0	3,342	3,175	5.0
Southeast	103,780	116,234	12.0*	17,365	17,365	.....	4,231	4,231	.....
Southwest	76,810	88,331	15.0*	10,658	10,658	.....	3,028	3,028	.....
Central Western	26,272	29,260	11.4*	7,415	8,205	10.7*	271	270	.....
Pacific Coast	32,415	29,336	9.5	9,552	8,100	15.2	.....	.....	.....
Pacific Northwest	5,595	3,980	28.9	4,694	4,707	.3*	194	164	15.5
Total	886,069	780,268	11.9	242,390	212,526	12.3	44,636	40,943	8.3

Traffic News

Rate-Adjustment Moratorium.—Railroad-rate officials are advising shippers in response to proposals for rate adjustments that the executives have issued an order that there are to be no rate changes published pending the outcome of the proceedings in the proposed 15-per cent. increase. Just how long this order will stand is a question, for certainly the carriers will lose traffic to motor trucks on such commodities as crushed stone and sand and gravel where many rates are published on short notice to cover special jobs. A recent investigation has developed the fact that operators are now hauling road-building materials in the southern part of Michigan, using a light truck and a trailer at a charge of 2 cents a ton-mile, and a charge of 3 cents a ton-mile is now common in Central territory over well-paved routes. It is certain that the amount of traffic going to trucks is rapidly increasing and many experienced railroad men are questioning the wisdom of the executives in giving this order.

Advisory Board Forecast.—The forecast of car requirements made by the various regional advisory boards indicates that there will be 7,082,186 cars of commodities loaded during the third quarter of 1931 as against an actual loading of 7,807,037 during the corresponding quarter of last year, or a total decrease of 9.3 per cent. The only prospects of increased movement are in citrus and other fresh fruits, potatoes and other fresh vegetables and in petroleum and petroleum products. The increase in citrus fruits amounts to 40.6 per cent. The largest decrease is shown in agricultural implements and vehicles other than automobiles, amounting to 41.7 per cent. All boards show a decrease in loadings except the Southwest, which shows an increase of 2.2 per cent.

Reports are available only on the commodities that move in large volume. The figures furnished by the various boards on commodities shipped by the nonmetallic-minerals industry are shown above, the "%" column showing the percentage of decrease under last year, except that figures followed by an asterisk (*) indicate the percentage of increase.

[1] The proposed car-load minimum weight will be 90 per cent. of the marked capacity of the car, except that when the car is loaded to full cubical or visible capacity, the actual weight will apply.

Explosives Makers Draft Releases from Liability

The Institute of Makers of Explosives has devised two forms of release from liability for any damage which may be done by blasts supervised by explosives manufacturers' field men, where conditions may occur which can neither be foreseen nor guarded against.

Therefore these forms have been adopted to avoid any questions or controversies which might arise in these matters and the users of explosives accepting free services of explosives companies' employees will be called upon to sign one or the other of these release forms, which read as follows:

"Whereas, the undersigned customer has requested certain assistance of ..... in connection with the performance of certain blasting work; and

"Whereas, ... is not engaged in blasting work, its business in explosives being confined solely to the manufacture and sale thereof, but to assist the said customer, the said ..... has agreed to permit said customer the temporary use, free of charge, of the services of said company's employes, together with or without certain needed equipment.

"Now, therefore, the undersigned hereby expressly agrees that, while engaged in said work, said employes and equipment are and shall be, to all intents and purposes, the employes and equipment of the undersigned and subject to his sole supervision and control, and that all work and services so performed shall be at the sole risk and responsibility of the undersigned, and for any damage or loss resulting from such services, except liability for injury or death of said ..... employes, the undersigned expressly agrees to indemnify and hold harmless the ..... Company, and further to assume sole responsibility for the result of the services of such employes or equipment gratuitously furnished by said ..... Company.

....."

Customer

Second Form.

"Whereas, the undersigned customer may hereafter, from time to time, request certain assistance of ..... in connection with the performance of certain blasting work; and

"Whereas, ... is not engaged in blasting work, its business in explosives being confined solely to the manufacture and sales thereof, but to assist the said customer, the said .....has agreed, at certain times, to permit said customer the temporary use, free of charge, of the services of said company's employes, together with or without certain needed equipment.

"Now, Therefore, the undersigned hereby expressly agrees that, while engaged in said work said employes and equipment are and shall be, on each occasion, to all intents and purposes, the employes and equipment of the undersigned and subject to his sole supervision and control, and that all work and services so performed shall be at the sole risk and responsibility of the undersigned, and for any damage or loss resulting from such services, except liability for injury or death of said ..... employes, the undersigned expressly agrees to indemnify and hold harmless the ..... Company, and further to assume sole responsibility for the result of the services of such employes or equipment gratuitously furnished by said ..... Company.

"This agreement shall continue in force until either party notifies the other, in writing, of its desire to terminate the same, but such termination shall not relieve either party of any liability arising thereunder prior to such termination.

....."

Customer

Correspondence

Verily, the Price-Cutter Maketh an Ass of Himself

To the Editor:

The appended story, derived from an unknown source, seems worth passing on:

"At the beginning of things, when the world was young, the donkey was esteemed by all the tribes of men as wisest of animals. The good Sheik El-Kandee owned a great herd of these sagacious beasts, which was the pride and joy of his life.

"Other Sheiks from miles around came to listen and marvel at the wisdom of the herd. At such a time came even the Prophet himself, most learned and wise of all the sons of the East. With much glowing pride, El-Kandee led him out to the herd and said:

" 'Behold, O Prophet, the wise and talented asses! Converse with them, test them, and see if they are not verily wiser than forty trees full of owls.'

"Then the Prophet addressed the asses. 'Let us test your wisdom,' said he. 'Answer me this question: What would an ass require for a three days' journey?'

"And they counseled among themselves and then made reply: 'For a three days' journey, O Prophet, any ass should require six bundles of hay and three bags of dates.'

" 'Very good,' quoth the Prophet; 'that soundeth like a fair and proper price.' Whereupon El-Kandee broke into loud chuckles and said: 'Did I not tell you they are passing wise?'

"The Prophet answered: 'Wait,' and he again addressed the asses, 'I have for one of you,' he said, 'a three days' journey, but I will not give six bundles of hay and three bags of dates for making it. Let him who will go for less stand forth.'

"And behold they all stood forth and all began to talk at once. One would go for six bundles of hay and two bags of dates. Then another for three bundles of hay and one bag of dates, until finally one especially long-eared ass agreed to go for one bundle of hay.

"Then spoke the Prophet, 'Fool,' quoth he, 'you can not even live for three days on one bundle of hay, much less profit from the journey.'

" 'True,' said the long-eared one, 'but I wanted to get the order.'

"And from that far-off day to this, asses have been known as fools, and price-cutters known as asses."

New York, N. Y. ONE OF THE ASSES.

Sees Autumn Demand for Ohio Agricultural Lime

To the Editor:

During the past two weeks I was on a trip through the southeastern part of this state and was very glad to note that there was an extremely good feeling regarding the economic situation. The farmers are harvesting the biggest wheat crop they have ever had, and, while the price is low, the large yield will somewhat overcome the disadvantage of a low price. I confidently expect that the coming fall season will be the biggest season for agricultural limes that the lime plants in Ohio have ever experienced, although perhaps not the most profitable.

One of the companies recently cut the price of finishing lime to $6.50, but the others are holding the price at $7.00. When I started in the lime business in 1921 the price had just been reduced to $13.50 from $14.50. Masons' hydrate and agricultural hydrate are now $5.50, and crushed stone is selling around 30 cents a ton at some of the plants; in some cases this is less than half the price it sold for last year. Some of the sand-and-gravel companies have cut the price of their products to 15 cents a ton.

Luckey, O. F. C. I.

Coöperate in National Parley on Construction

Among the organizations coöperating with the National Conference on Construction are the Portland Cement Assn. and the National Crushed Stone Assn. The conference was organized early this year under the general chairmanship of Robert P. Lamont, secretary of commerce, and is at work preparing reports for consideration of the executive committee.

The purposes of the Conference are: (1) to review the outstanding common problems of business and other interests identified with public and private construction; (2) to select a limited number of problems of the above type which will lend themselves step by step to constructive inter-group action; (3) to develop the necessary factual studies of such problems; (4) to agree upon recommendations to be made to the coöperating agencies—public and private—looking toward the solution of such problems.

B. F. Affleck, president of the Universal-Atlas Cement Co., of Chicago, and A. L. Worthen, vice-president and general manager of the Connecticut Quarries Co., Inc., of New Haven, Conn., are members of the executive committee.

Blaze After Explosion Damages Ohio Operation

An explosion, the cause of which has not been determined, started a blaze which partially destroyed the Taylor Stone Co. crushed-stone plant, located a mile and one-half north of Ada, O., entailing damages estimated at $4,000 early this month.

E. C. Taylor, head of the concern, stated that plans would be started immediately toward re-building. The loss was only partially covered by insurance.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Canada Cement Outlook Good; Prices Stay Firm

As the Canada Cement Co. of Montreal swings into its busy season of the year, indications point to a good volume of business for 1931. Large power projects now under way, including the Beauharnois development, Chats Fall power project and the Abitibi Power & Paper development at Abitibi canyon, as well as other large projects, such as the Canadian National Railways new Montreal terminal, require important quantities of cement. Also, a number of Canadian cities, including Montreal with a contract for nearly $500,000, Winnipeg, Hamilton, Ottawa and Brantford, have placed orders with the company this year for cement required on various civic projects.

In view of the decline in general construction, small orders and retail business may not reach a large total this year, however.

Canada Cement has been affected only to a limited extent by the price cutting in the United States. The company does not suffer much from competition with imported products, because of the heavy expense in shipping cement any distance. Only at certain centers near the border has it been necessary to meet the low prices quoted by United States companies.

The company through various plant changes has improved its efficiency in recent years. This year, the Port Colbourne, Ont., plant is being converted to the wet process—the last of the company's plants to be changed over to the cheaper and more efficient system of manufacture. The capacity of the Montreal East plant was increased to 15,000 bbl. daily from 10,000 by the change. The work at Port Colbourne will cost about $500,000.

During the past four years the present company has been in operation, the management in following its policy of paying for plant improvements out of earnings has plowed back some $8,000,000 into property, thus increasing the equity behind the securities and avoiding an increase in fixed charges.

For the fiscal year ended November 30, 1930, the company reported net income, after all charges including interest and various write-offs for depreciation, reserves, etc., at $1,566,014, equal after preferred dividends to 34 cents a share on 600,000 shares no-par common. The balance sheet showed current assets at $5,539,852, against current liabilities of $1,781,107, indicating working capital of $3,758,745. Investments were valued at $6.097,783, against $7,047,015 the year before, while reserves, exclusive of the depreciation reserve, were carried at $1,169,228.

Profits for last year were equal to approximately three times bond interest requirements.

The cumulative 6½-per cent. preferred stock, currently quoted around 90, yields about 7.2 per cent., while the common, on which no dividends have been paid is selling at around 11.

Canada Cement operates 15 plants in four provinces to handle four-fifths of the Dominion's cement requirements. In recent years, distribution efficiency has been increased through the purchase of two steamers to carry bulk cement to newly-established storage and packing plants, and bring back raw materials.

$9,000,000 Serial Notes to Finance Glass Plants

The Libbey-Owens-Ford Glass Co. will issue $9,000,000 of 5 per cent. serial notes to finance the purchase of the sand deposits and plant of the National Plate Glass Co., at Ottawa, Ill., a subsidiary of General Motors Corp.

The General Motors Corp. has subscribed for $3,500,000 of the notes at par, plus accrued interest, in part payment for the two plants it is selling Libbey-Owens-Ford. The remaining $5,500,000 has been underwritten by a group of the company's stockholders, but all shareholders will be given prior opportunity to subscribe for the notes at par, plus accrued interest, under terms to be announced later.

Libbey-Owens-Ford will supply General Motors with practically all its glass requirements during the next seven years and during that period will sell the organization approximately $50,000,000 worth of glass.

Kentucky Rock Asphalt Profit Higher in 1930

The Kentucky Rock Asphalt Co., Louisville, Ky., reports earnings of $1.70 per share in 1930 as compared with $1.49 in 1929. The company produces rock asphalt, which is marketed under the brand "Kyrock," from three plants located at Bowling Green, Rockport and Kyrock, Ky.

The earnings report for 1930 as compared with 1929 follows:

	1930	1929
Net operating profit	$562,364	$520,760
Other income (net)	36,091	31,187
Total income	$526,273	$489,573
Interest on first mortgage bonds	66,605	67,307
Depreciation and depletion	109,595	106,804
Income taxes accrued	43,000	34,258
Net available for dividends	$307,073	$281,204
Preferred dividends	91,322	91,322
Net available for common stock	$215,751	$189,882
Shares of common stock outstanding (no par)	126,819	126,793
Earnings per share	$1.70	$1.49

Indiana Limestone Plans Adjustment of Finances

The Indiana Limestone Co. is planning to readjust its financial structure with a view to placing the company in better position to weather extended periods of slack construction activity.

Committees representing mortgage-bond and debenture holders have been formed and are working in conjunction with junior security holders and company officials toward this end. Details of the plan are not now available according to *Wall Street Journal.*

CURRENT DIVIDENDS

COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE	COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE
Arundel Corp	Common	$0.75 qr.	June 22	July 1	Lawrence Portland Cement	Common	$1.00 qr.	June 15	June 30
Alpha Portland Cement	Common	$0.25 qr.	July 1	July 25	Lehigh Portland Cement	Preferred	$1.75 qr.	June 13	July 1
Boston Sand & Gravel	Preferred		June 22	July 1	Lock Joint Pipe	Common	$0.67M	June 30	June 30
Calaveras Cement	Preferred	$1.75 qr.	June 30	July 15	New York Trap Rock	Preferred	$1.75 qr.	June 20	July 1
Canada Cement Co.	Preferred	$1.62½ qr.	May 30	June 30	Pacific Portland Cement	Preferred		June 30	July 1
Canada Dredge and Dock	Common		July 16	Aug. 1	Pennsylvania Salt	Common	$0.75 qr.	June 30	July 15
Canada Dredge and Dock	Preferred		July 16	Aug. 1	Santa Cruz Portland Cement	Common	$1.00 qr.	June 20	July 1
Dolese & Shepard	Common	$1.00 qr.	June 30	July 1	Southwestern Portland Cement	Common		June 30	July 1
Dufferin Paving & Crushed Stone	1st Pfd.	$1.75 qr.	June 19	July 2	Southwestern Portland Cement	Preferred		June 30	July 1
Fitzsimons & Connell	Preferred	$1.75 qr.	June 20	July 1	Superior Portland Cement	Class A	$0.27½ M	June 23	July 1
General Aggregates	Common	$0.25 qr.	July 1	July 15	United States Gypsum	Preferred	$1.75 qr.	June 15	June 30
Ideal Cement	Common	$0.75 qr.	June 15	July 1	United States Gypsum	Common	$0.40 qr.	June 15	June 30
International Salt	Common	$0.75 qr.	June 15	July 1	Warner Co	1st Pfd.	$1.75 qr.	June 15	July 1
International Portland Cement	Common	$0.25 qr.		June 30	Warner Co	2nd Pfd.	$1.75 qr.	June 15	July 1
Kelley Island Lime & Trans.	Common	$0.50 qr.	June 20	July 1	Warner Co	Common	$0.25 qr.	June 30	July 15

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Review of Foreign Practice

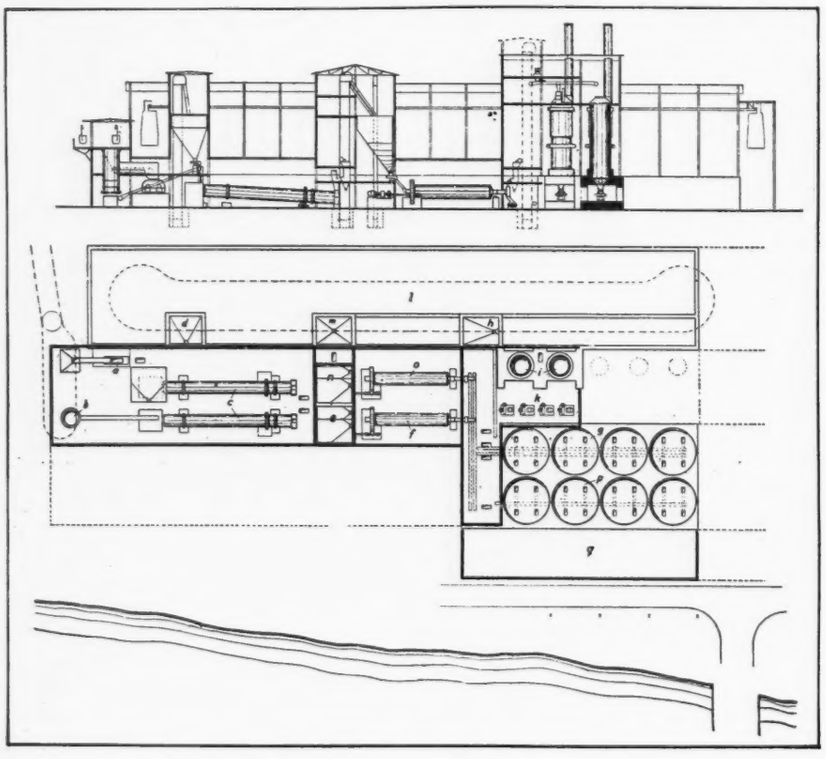
Shaft-Kiln Cement Plant in Operation in Turkey

At the village of Zeytin Burnu about 8 kilometers from the heart of Istambul (formerly Constantinople), lies the new cement plant of the Turk Cimentosu ve Kireci, which, encouraged by the success of several shaft-kiln plants built in the Near East within the past few years, operates with revolving-grate shaft kilns, with a capacity of 200 to 300 tons of cement daily.

The raw materials, limestone and clay, are obtained from a quarry some two kilometers away, and are transported to the plant by an aërial tramway. Limestone is crushed in a hammer-mill (*a* in the drawing) and clay in the cutter mill (*b*). Both materials then pass through their respective rotary driers (*c*). The raw materials then pass through feed bins (*c*) to the 2-meter by 12-meter three-compartment raw-grinding mill (*f*), although the conveyor system is laid out so that either raw materials or clinker can be ground in either of two identical mills. The raw mix is carried to storage and mixing silos (*g*) and thence to the two kilns, 2.6 meters in diameter and 10 meters high (*i*). Firing of the kilns is done with coke from the bin (*h*). Two fans (*k*) for each kiln force the draught.

Clinker is carried to the storage shed (*l*) which also stores gypsum and coal, and is served by an overhead conveyor. Clinker is reclaimed to the bunker (*m*) and fed through the feed bin (*n*) to the finish mill (*o*). Finished cement is stored in the four circular silos (*p*), and is packed in the bagging plant (*q*) either paper or jute sacks being employed.

The plant is served by electric power from Istambul, using 72 kw.-h. per ton of cement produced, and its operation is so automatic that, outside of the packers, only ten to twelve men are employed. Like other plants formerly constructed at Ankara (Turkey), Massarah (Egypt) and Haifa (Palestine), the Zeytin Burnu plant was designed and equipped by the Curt von Grueber Maschinenbau Akt.-Ges. — Dr. - Ing. Horst Laeger in *Tonindustrie-Zeitung* 55:322-325, March 16, 1931.



Plan and elevation of shaft-kiln cement plant near Istambul.

Machine Drilling Found to be Most Economical

Two important developments in the German stone industry during the past ten years have been the introduction of chamber blasting and the replacement of hand by machine methods in drilling. The effect of the latter development is studied in this article, comparing the costs by the two methods in a number of West German basalt quarries during a number of years from 1913 on that can be considered "normal." In each case, the proportion of the total excavating costs represented by drilling is determined, and the general result obtained is that hand work increases excavating costs by about 16 per cent. as compared with machine drilling, and total production costs by about 5 to 6 per cent.—Dr.-Ing. Stein in *Steinindustrie*, 26:107-111, April 16, 1931.

Effect of Grinding on Setting Time of Cement

Last year the author of this article reported that a long period of grinding of coarse clinker in a small laboratory mill, using large steel balls, makes the resulting cement rapid-setting, even though the finished cement is shown by sieve analyses with the 4900-mesh/sq.cm. sieve to be still fairly coarse. To explain this phenomenon, he made further investigations, using the Mayntz-Petersen air separator, which are reported here. By sieve analyses with the 4900 and 10,000-mesh/sq.cm. sieves and the Mayntz-Petersen air separator, cements which through long grinding of coarse clinker particles with large steel balls became rapid-setting were found to be much coarser than the cements of normal set, ground from smaller clinker with smaller grinding balls. When clinker and gypsum are ground alone and mixed later, the cement is not rapid-setting, even though it is ground much longer than the same clinker with gypsum mixed before grinding. The exact cause of the rapid setting in consequence of long period of grinding could not be completely determined from the investigation.—K. Koyanagi in *Zement*, 20:467-9, May 14, 1931.

Manganese-Steel Maker Names Representatives

In addition to established branch offices in New York, Pittsburgh, Detroit, Chicago and Los Angeles, the Manganese Steel Forge Co., Philadelphia, Pa., manufacturers of Rol-Man rolled and forged manganese-steel products, recently has appointed the following representatives: J. G. Logan, P. O. Box 506, Knoxville, Tenn., serving the states of Tennessee, North Carolina, South Carolina, and Georgia; S. L. Morrow Engineering Co., Brown-Marx Bldg., Birmingham, Ala., serving the state of Alabama, Northern Mississippi and Western Florida; C. T. Patterson Co., Inc., 801 Tchoupitoulas St., New Orleans, La., serving the state of Louisiana and Southern Mississippi, and C. H. Collier, 301 N. Market St., Dallas, Texas, serving the state of Texas.

Recent Patents

AMERICAN

Burning

Lime kiln. Arthur Ackerman, New York, N. Y. No. 1,812,672.

Rotary cement kiln and cooler. Povl T. Lindhard, Brooklyn, N. Y., assignor to F. L. Smidth & Co., New York, N. Y. No. 1,813,061.

Crushing and Grinding

Pulverizing apparatus. Robert S. Riley and Ollison Craig, Worcester, Mass., assignor to Riley Stoker Corp., same place. No. 1,811,438.

Grinding mill. Viggo Sahmel, Forest Hills, N. Y., assignor to F. L. Smidth & Co., New York, N. Y. No. 1,813,086.

Hammer crusher. William A. Battey, Haverford, Pa., James E. Stine, Aldan, Pa., and George W. Borton, New Lisbon, N. J., assignors to Pennsylvania Crusher Co., New York, N. Y. No. 1,813,836.

Excavating

Excavating and scraping apparatus. Allan B. Shaw, Delaware, O. No. 1,811,030.

Steam-shovel safety attachment. George R. Ingham, Ajo, Ariz. No. 1,811,581.

Excavator. Arthur Orloff, Green Bay, Wis., assignor to Northwest Engineering Corp., same place. No. 1,812,662.

Excavating machine. Frank A. Buckland, Rochester, N. Y. No. 1,812,925.

Excavating machine. Frank A. Buckland, Rochester, N. Y. No. 1,812,926.

Excavator. Edward Bauer, Milwaukee, Wis., assignor to Bucyrus-Erie Co., same place. No. 1,813,110.

Boom suspension. Werner Lehman, South Milwaukee, and Trevor Davidson, Milwaukee, Wis., assignors to Bucyrus-Erie Co. No. 1,813,119.

Dipper-handle. John D. Rauch and William L. Reid, Lima, O., assignors to Ohio Power Shovel Co., same place. No. 1,813,864.

Washing

Method and apparatus for cleaning gravel or the like. Guy B. Bebout, Zanesville, O. No. 1,812,280.

Miscellaneous

Apparatus for hoisting and distributing loose material. John P. Faber, Dunellen, N. J., assignor to Ransome Concrete Machinery Co., Plainfield, N. J. No. 1,812,328.

Gypsum concrete. George D. King, Chicago, Ill., and Fred J. Gough, Fort Dodge, Ia., assignors to United States Gypsum Co., Chicago. No. 1,813,452.

Mining machine. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place. No. 1,813,803.

FOREIGN

Cement and Concrete

Production of hydraulic cement. G. O. Case, E. M. Ellis and L. H. Montigue. British 345,103.

Surface-treatment of concrete and other materials which are pervious to moisture. E. O. Cowper. British 345,671.

Process for densifying cement mortar, concrete or the like. Dr. Egon Meier, Halle-a. d. S.—Nietleben, Germany. German 528,807.

Crushing and Grinding

Grinding, crushing and pulverizing machinery. G. Clark. British 344,890.

Grinding or crushing mills. F. E. Marcy. British 345,192.

Grinding mills. E. Barthelmess. British 345,388.

Pulverizing apparatus. Chauffe & Combustion, Soc. Anon. British 345,465.

Pulverizing mills. Soc. Francaise de Constructions Mecaniques Anciens Etablissements Cail. British 345,534.

Process of grinding materials. John H. Lundteigen, Detroit, Mich. Canadian 312,909.

Drilling

Rock-drills and the like. V. Muto. British 345,099.

Percussion tools. L. Rasch. British 345,144.

Dust-removal in drilling with compressed air. Dr. Karl Brunzel, Koblenz. German 528,577.

Device for hammer drills. Hans Strohschneider and Hugo Stockermann, Albringhausen, Germany. German 528,734.

Rock-drill valve. The Ingersoll-Rand Co., New York, assignee of William Arthur Smith, Phillipsburgh, N. J. Canadian 313,072.

Rock-drill valve. The Ingersoll-Rand Co., New York, assignee of John Clark Curtis, Easton, Pa. Canadian 313,073.

Drying

Drying-apparatus. G. W. Riley and G. Scott & Son, London, Ltd. British 345,302.

Tunnel drying-ovens. J. G. Olsson and F. I. E. Stenfors. British 345,531.

Rotary drier for construction materials. Firma Albrecht Reiser, Berlin-Hohenschonhausen, Germany. German 528,655.

Apparatus for drying moist precipitates, particularly lithopone. "Sachtleben" Akt.-Ges. fur Bergbau und Chemische Industrie, Homberg, Niederrhein, Germany. German 528,656.

Kilns

Rotary cement kilns. M. Vogel-Jorginsen. British 345,731.

Material-Handling

Belt-conveyor apparatus. A. Sauvee & Co. Ltd. and H. W. Cadman. British 344,940.

Screw conveyors. Caterpillar Tractor Co. British 345,566.

Cranes. Walker Bros. (Wigan) Ltd., J. S. A. Walker and A. G. Walker. British 345,696.

Apparatus for tipping and discharging cars. B. E. Ellson. British 345,809.

Measuring device for pulverulent or granular material. Fritz Moser, Zollikon, Switzerland. German 528,440.

Conveyor device. Paul Best, Wiesbaden. German 528,450.

Conveyor system. Lubecker Maschinenbau-Gesellschaft, Lubeck. German 528,562.

Two-part device for attaching elevator buckets to belts. A. W. Mackensen G. m. b. H., Magdeburg. German 528,451.

Coupling device for shaking conveyor. Soc. Anon. de Constructions Metalliques de Bethune, Bethune, France. German 528,454.

Feeding and discharging device. Wilhelm Back, Erwitte i. W., Germany. German 528,336.

Mixing

Machines for mixing concrete and other materials. J. A. Davies and J. Buchanan & Son (Liverpool) Ltd. British 345,638.

Concrete mixer. Gebhard Jaeger, Columbus, Ohio. German 528,441.

Plaster-mixing machine. The Bancroft Holdings, Ltd., assignee of Henry Stinson Johns, Hamilton, Ont. Canadian 313,013.

Sacking

Sack filling and weighing machines. J. Gravenholdt. British 345,535.

Screening and Separating

Separation of dry materials. C. W. H. Holmes and Birtley Co., Ltd. British 344,802, 344,803 and 344,804.

Separation of dry materials. I. L. Bramwell and Birtley Co., Ltd. British 345,275.

Screening, consolidating and like vibratory apparatus. Sunderland Forge & Engineering Co., Ltd., and G. Blair. British 345,422.

Rotary screens. A. C. Anderson and A. Schie. British 345,602.

Unclassified

Treatment of bauxite, alunite and like aluminous material. Sulphates Proprietary, Ltd. British 344,959.

Apparatus for drying filter-cake. G. W. Johnson (Proctor & Schwartz). British 345,247.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

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Legal Information for Operators

When a Municipality Is Liable for Negligence

FREQUENTLY manufacturers, sellers and users of nonmetallic-mineral products have occasion to determine whether a municipality is liable for negligence of its officials or employees. Such necessity may arise, for example, where a litigation involves the sale or use of non metallic-mineral products. In other instances it may be required to determine whether a muncipality is liable for damages caused by its employees who wrongfully turn off or interfere with the water, gas, or electric supply. In other cases the questions have arisen whether a muncipality is liable for goods destroyed by water which leaks from water mains, sewers, etc., and whether a municipality is liable where a nonmetallic-mineral plant burns as a result of negligence of the municipal fire-department employees who fail to maintain the fire-extinguishing equipment in good repair. On other occasions plant employees have been injured as a direct result of negligence of city employees and it is necessary to determine whether, under the circumstances, the city is liable for the injurious acts so caused.

First, it is important to know that the powers and duties of municipal corporations are of twofold character: one class regards the state at large; the other class is private, in so far as they provide the local necessities and conveniences for their own citizens.

In other words, a municipal corporation possesses two kinds of powers, one governmental or public, which is exercised and clothed with sovereignty; the other is a private power which is exercised somewhat as the legal right of an ordinary individual. The former is for public purposes; the latter is for private purposes. In the exercise of the governmental duties, a municipality is a form of government and, in the exercise of the ministerial duties, it is a corporate legal individual.

Therefore, it is well settled that municipal corporations have certain powers which are governmental in character, and also certain powers which are ministerial. A municipality will not be held liable by the courts in damages for negligence of its employees in the exercise of its governmental powers of a public nature, but it is liable for damages caused by neglect of its private duties which are ministerial.

Where a project is conducted by a municipality in part for profit, even if principally for public purposes, the municipality is liable for damages caused by its negligent management, because such duties are purely ministerial. For instance, a municipality is liable for negligence of its employees when operating a power-plant, gas, electric or water system, and sewage-disposal plant. Also, it is liable for negligence of its employees where damage results from overflowing of a sewer into a place in which non metallic-minerals are stored, or where negligence in the maintenance of its streets results in injury to persons or property traveling over them. Moreover, an important point of the law is that a city is liable for its negligence in shutting off water, gas or electricity supply.

Where the duties are of a legislative or judicial nature and the proper exercise of them depends upon the judgment of officials, the corporation is not responsible in damages, either for a failure to perform them, or for errors in their performance.

For illustration, in the late case of Barcus v. Coffeyville, 282 Pac., 698, a higher court said:

"The general rule, well settled in this state and elsewhere, is that, in the performance of governmental functions, neither the state nor any of its political subdivisions is liable in damages for the negligence of its officers. . . . . In the maintenance and operation of its fire department, a city acts in its governmental capacity. . . . . The power conferred by the statute, on cities of this state, to organize and regulate fire companies, and provide engines, etc., for extinguishing fires, is, in its nature, legislative and governmental; and a city is not liable to individuals for damage resulting from a failure to provide the necessary agencies for extinguishing fires, or from the negligence of officers or other persons connected with the fire department."

Also, any negligent act performed by a police officer is a governmental act for which a municipality is not liable. In Steele v. McKeesport, 148 Atl., 53, in holding a city not liable, the court said:

"Here it was a police governmental act, designed to protect the citizens congregated in the street, that brought about the injury to plaintiff. . . . It has repeatedly been held that, except where a right to recover is expressly given by act of assembly, no suit lies against municipalities for negligence of their police or fire departments. . . . Marked exceptions to this rule, such as the highway, public works, and nuisance cases, do not affect the general principle."

A simple rule by which to determine whether a municipal project is a governmental or ministerial function is this: If it is for profit, it is ministerial. And when the city is not actually engaged in a business for profit or convenience, the test as to municipal liability or nonliability may be summarized as follows:

It is well settled that a municipal corporation is never liable for the legal and proper exercise of a strictly government function, or for a breach or neglect of a public duty constituting a public evil or nuisance, where the only remedy is by indictment for a criminal offense, although individuals may sustain injury thereby; but the city is liable where its wrongdoing creates only a private nuisance, for which no indictment for a criminal offense will prove effective.

The latest case involving this phase of the law was that of Casey v. Bridgewater Tp., Somerset County, 151 Atl., 603.

The facts of this case are that a municipality contracted with the owner of a gravel pit whereby the city hired men to dig and haul gravel from the pit for use in repairing its streets. An employee was seriously injured when the pit caved in. He sued the municipality for damages, alleging that it was liable because, in hauling the gravel, it was engaged in a business for profit. However, the court held the municipality not liable, stating the following important law:

"No active wrongdoing is chargeable to the municipal corporation, which hired the men merely to dig, load, and cart away the gravel for use in the road work in progress. The municipality cannot be said to have been engaged in business for profit merely because it made an agreement incidental to the performance of its public duty to build and repair its roads, no matter how advantageous the contract may have been. It did not own the pit, neither did it maintain or operate it. It bought the gravel with the right to dig and remove it, in such quantities as was required for the work. It was therefore acting wholly within the scope of its functions, in the performance of a public duty."

Obviously, however, a city would be engaged in a ministerial function and liable for injuries to employees who work in a gravel pit owned, maintained and operated by the city.

Orders Owner to Pay for Gravel Used in Building

Generally speaking, an employer is not liable for a contract made by his salesman unless he accepts or approves the agreement. In other words, the implied authority of a salesman is merely to solicit orders which must be approved by his employer before the latter is bound by any agreement purported to be made by the salesman.

For example, in the late case of Acme Gravel Co. v. Bryant, 295 Pac. 909, it was shown that a gravel company delivered to an apartment building owner $2,153 worth of gravel. Litigation developed when the apart-

(*Continued on page 71*)

Manufacturers' Publications

Each publication listed below contains information of interest to nonmetallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Air Separators

Kent Filter Air Separator. 4 p., 3 ill. (Bull. No. 44. Kent Mill Co., Brooklyn, N. Y.) Describes and illustrates an air separator made in sizes from 2- to 5-hp. for the separation and classification of cement, limestone, gypsum, etc., at 20 mesh or finer.

Ball Bearings

Engineering Data Book—Fifth Edition. 140 p. Illustrated. (The Fafnir Bearing Co., New Britain, Conn.) A pocket-size book filled with complete data to assist the engineer in applying ball bearings to all types of machinery. Includes load ratings, bearing and housing dimensions, bits, information on types, etc.

Blasting

"Bauxite Mining in Northern South America." 5 p., 11 ill. *(The Dupont Magazine* for June, 1930. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.) Describes and illustrates blasting practice as employed at the open-pit mines in British and Dutch Guiana, where more than 20 per cent. of the world's production of this mineral is obtained.

Blowers

Ingersoll-Rand Turbo-Blowers and Turbo-Compressors. 44 p. Illustrated. (Bull. No. 3132. Ingersoll-Rand Co., New York.) Describes and illustrates the construction and operation of single-stage and multi-stage blowers for discharge pressures of one to 40 lb. and capacities of 3,000 to 100,000 cu. ft. per min., and turbo-compressors for discharge pressures up to 110 lb. and capacities of 8,000 to 10,000 cu. ft. per min.

Concrete Carriers

Blaw-Knox Trukmixer. 16 p. Illustrated. (Bull. No. 1306. Blaw-Knox Co., Pittsburgh, Pa.) Contains specifications and a detailed description of a concrete carrier made in three types—(1) a mixer truck, (2) a drum-type agitator and (3) an open-type agitator.

Drills

Loomis Clipper Blast-hole Drills. 48 p. Illustrated. (The Loomis Machine Co., Tiffin, O.) Describes and illustrates a line of popular blast-hole drills for quarry work. Illustrations show complete rigs in operation as well as detailed views of various parts of the equipment.

Electrical Equipment

Benjamin Electrical Products. 182 p. Illustrated. (Cat. 24-A. Benjamin Electric Manufacturing Co., Chicago, Ill.) A complete, condensed catalogue of electric-lighting and wiring equipment.

Generators, Steam

Combustion Steam Generator. 20 p. Illustrated. (Cat. SG-1. Combustion Engineering Corp., New York, N. Y.) Describes and illustrates a steam-generator, a single unit embodying in an integral design the several elements required in the production of steam. The units are available in eight sizes up to a rating of 200,000 lb. of steam per hour.

Lubrication

The Keystone Safety Lubricator. 52 p. Illustrated. (Keystone Lubricating Co., Philadelphia, Pa.) Explains, by the question-and-answer method, the advantages and principal features of a centralized lubricating system for industrial machinery. Contains operating views. Lubricating methods in cement and lime plants are featured.

Power Transmission

Morse Silent Chain Drives. 104 p. Illustrated. (Bull. No. 38. Morse Chain Co., Ithaca, N. Y.) A data book describing and illustrating silent chain and sprockets. Contains information of value in designing and applying the particular drive to the service it is to render.

Types "C" and "S" Speed Reducers —Speed Increasers. 8 p. 18 ill. (Bull. No. 233. Crocker-Wheeler Electric Manufacturing Co., Ampere, N. J.) Describes and illustrates a series of self-contained motor- and speed-changer units for a wide range of industrial applications.

Screen Cloth

Jersey Wire Cloth. 72 p. Illustrated. (John A. Roebling's Sons Co., Trenton, N. J.) A loose-leaf catalogue describing and illustrating a complete line of wire cloth for screening purposes. Contains Bureau of Standards Specifications for Sieves.

Structural Materials

Maryland Metal Buildings. 72 p. Illustrated. (Maryland Metal Building Co., Baltimore, Md.) An engineering catalogue of standardized metal buildings. Architectural drawings and photographs of lime and crushed-stone plants are included.

Truck Bodies

Truck Bodies for Quarry Service. 12 p., 26 ill. (Bull. No. 40. Easton Car & Construction Co., Easton, Pa.) Describes and illustrates dump-truck bodies designed especially for use in quarries. Contains installation views and a list of quarries using Easton bodies and the truck-transportation system.

Orders Owner to Pay

(Continued from page 70)

ment-building owner refused to pay the full cash price for the gravel on the contention that the salesman had promised that his employer would accept 25 per cent. cash and 75 per cent. in the preferred capital stock of the building corporation engaged in erecting the apartment building.

The apartment-building owner testified, and produced other witnesses who verified such testimony, that the salesman representing the gravel company had solicited an order for the gravel and was told that to secure the order it would be necessary for the gravel company to take 75 per cent. of the value of the material in stock, and that the salesman advised he would have to take the matter up with his company; and that three or four days later he returned and stated that the stock would be accepted by his employer as part payment. Thereupon deliveries began.

The president of the gravel company testified that neither he nor anyone else in authority had ever authorized the salesman to negotiate a sale of materials for anything other than cash, and that he had not approved the contract made with the owner. Therefore, the higher Court held the apartment building owner required to pay full cash for the gravel, and said:

"It is elementary that an agent has only such authority as the principal either actually or ostensibly confers upon him. . . . Actual authority is such as a principal intentionally confers upon the agent, or intentionally, or by want of ordinary care, allows the agent to believe himself to possess. . . . Ostensible authority is such as a principal, intentionally or by want of ordinary care, causes or allows a third person to believe the agent to possess. . . . Here there is neither proof of actual authority nor of any act on the part of any of its officers, sufficient to establish ostensible authority."

Book Review

CONSTRUCTION COSTS—1930. *Engineering News-Record, 342 W. 42nd St., New York, N. Y. 110 p., illustrated. Price $1.00.* A national index of general construction costs in the United States for the year 1930. In the ten years since its original publication, ample evidence has accumulated as to its value for many specific uses. The book is helpful in financing operations, in estimating, and in valuation. Its possible application in special problems must be determined by the individual user after careful comparison with known facts. A number of charts accompany the tables, comparing the cost index used with many other indexes, both general and specific.

New Machinery and Supplies

New Stock-Pile Loader for Average Operations

In the belief that there are in existence today many stock-pile loading jobs which do not require the full power and capacity of regular Haiss models, the George Haiss Manufacturing Co. has designed a loader especially for average stock-pile loading requirements—a powerful, high-speed machine at a moderate cost.

High-speed stock-pile loader.

This new Haiss Model 50, because its price is lower, and because Haiss manufacturing standards assure lowest maintenance cost, is said to enable the purchaser to operate at maximum economy.

Despite its popular price, the Haiss 50 is built with the same strength, precision and quality throughout, as are the large Haiss machines now in use. It has a capacity of from 1½ to 1¾ cu. yd. per min. handling materials in lumps not larger than 6 in. and weighing no more than 125 lb. per cu. ft.

Driven by a 37 h.p. 4-cylinder engine equipped with intake air cleaner, oil filter, gasoline strainer and inbuilt governor, the Haiss Model 50 has the extra power which assures continued adherence to its rated capacity schedule.

It has an enclosed roller-and-ball-bearing transmission, with all gears and clutches running in oil. Another important feature is the feeding device, which consists of the patented manganese-steel feeding propellers for which the larger Haiss machines are well-known. Manganese steel has been incorporated at many other points of wear so that the life of the machine is considerably lengthened.

There are only five controls so that operating is especially easy. The truss-type boom is balanced on a pivot shaft and raised or lowered by a handwheel which operates worm-gear and jack-knife levers. The boom is self-locking in any position. High side guards and head enclosures minimize spillage and there is also a spillage pan to return material to loading point. There are tooth-edged, 12 in. by 18 in. seamless forged buckets.

The net weight of the loader is 13,600 lb. It is manufactured with every type of discharge equipment. The George Haiss Manufacturing Co., Inc., New York, N. Y., will send the Model 50 bulletin on request.

Multi-Cyclone Collector Uses Renewable Liners

It has many times been demonstrated in both theory and practice that, for a given draft loss, a small cyclone is more efficient as a dust collector than a large one. The size is limited, however, by practical considerations. A cyclone which is as close to ideal as possible in size, proportions and design and at the same time meets industrial requirements, is used as the basic unit of the Thermix Type 5 multi-cyclone collector. The number of cyclones arranged in parallel, then becomes the only variable, and this is determined by the volume of gas to be handled.

One of the particular features of this collector, which is manufactured by the Prat-Daniel Corp., New York, N. Y., is the ability to change automatically the actual number of cyclones in operation with varying requirements when this is desirable. This is of importance because of the inter-relationship between the specific gravity of the particle to be collected, the thickness of the layer of gas through which the particle must travel to reach the wall of the cyclone, the radius of the cyclone and the velocity and viscosity of the gas.

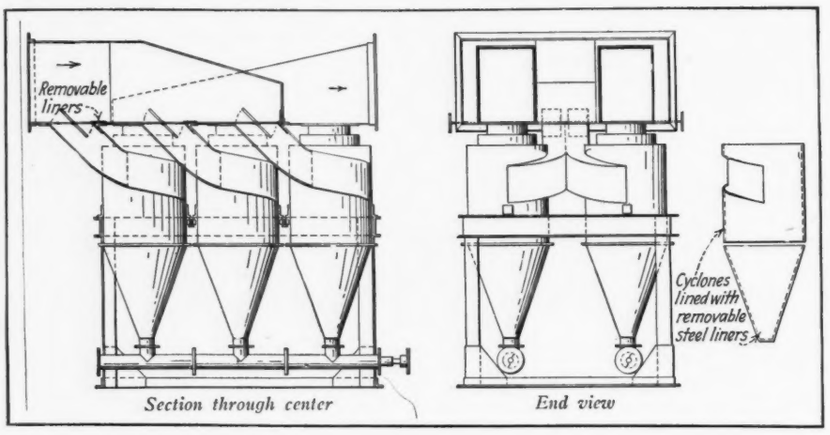
The cyclones are arranged in compact right and left-hand units. All are standard in size and dimensions. The cyclones themselves are lined with steel or cast-iron wearing plates, which are interchangeable in any unit. By unbolting the exterior cone of the cyclone from the cylindrical portion, the cylindrical liner and conical liner are easily and rapidly installed. The wearing points in the duct work are similarly protected.

Additional units may be added if future requirements make this desirable, with no other change than the capacity of the inlet and outlet ducts.

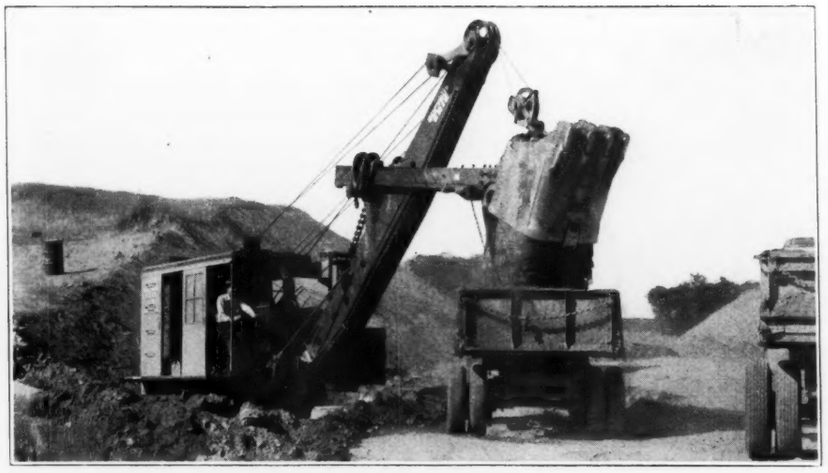
The Type 5 multi-cyclone collector is particularly applicable to those installations where sufficient draft exists to permit the introduction of its resistance to the flow of gas. Of course, it is equally applicable where an induced-draft fan is to be installed which will take care of any added resistance of a dust collector. It is also useful in cases where excessive erosion from the particles in the gas is a possibility, it can be placed before the fan and is particularly well armed against wear and can be arranged so that all wearing-parts of the cyclone can be replaced without interrupting operation.

Convertible Excavator Lightweight, Yet Rugged

The new 32-B, 1-cu. yd. Bucyrus-Erie convertible shovel - dragline - crane-clamshell, is modern in every respect. Its many features, making a list unparalleled for a machine of this size, contribute to its ability to meet present day competition. Weight is held down to a minimum by simplicity and elimination of unnecessary bulk where bulkiness does not contribute needed strength, although the machine is ruggedly built. Special attention has been given to balancing the various motions hoisting, crowding, swinging and



The multi-cyclone dust collector.



The new model 32-B excavator.

dumping so as to secure a minimum time for the complete cycle. Stability, accessibility, quick convertibility and most efficient transmission of power to give maximum digging force at the dipper teeth are features of this machine.

Outstanding items of interest include choice of gasoline, Diesel or electric power, either rope or chain crowd on shovel, special extra long and wide mountings for soft ground drag-line work. All continuously running shafts are mounted on ball bearings. Engine transmission gears are fully enclosed and run in oil as do also the boom-hoist worm and gear and the reversing transmission gears for swinging and propelling. So that there will be no binding of bearings there are only two bearings to a shaft. The transmission gears are silent with generated teeth, machine-cut from solid steel. There is an outside band power-take-off clutch and positive power dipper trip. The machine has a box girder boom and outside handles, single-shaft drive crawler mounting and an inserted tooth dipper.

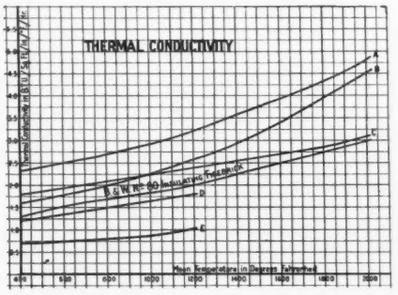
New Firebrick Has High Insulating Properties

The Babcock & Wilcox Co. announces a new firebrick known as the B. & W. No. 80 Insulating Firebrick. Although this material has been previously made experimentally, no practical method of manufacturing it in brick sizes has been developed until recently. The Company has now installed the necessary equipment and is producing on a commercial scale.

The No. 80 insulating firebrick is an entirely new material for furnace work. It is not only an insulator but is the equal of a first-quality firebrick. Its insulating properties are better than a number of high-grade insulators and in addition it has refractory qualities which compare favorably with any high-grade firebrick.

The accompanying curves show the thermal conductivity the firebrick compared with that of several of the better known insulators. The curve shows clearly that the insulating qualities of this new firebrick are extremely high. *A*, *B* and *C* are thermal conductivity curves of three leading high temperature insulators while *D* and *E* are curves of intermediate temperature insulators.

When used as linings for intermittent furnaces, the No. 80 insulating firebrick will result in very great fuel savings during the heating up periods. As an example, a furnace so lined and designed to have the same heat flow through the walls as one lined with firebrick will have about one-sixteenth the heat-storage capacity. As the heat-storage capacity of any furnace depends on the weight of the heated furnace structure and the depth of heat penetration, it is easily seen that since



Comparison of thermal conductivity.

a furnace built of 18 in. of firebrick backed with 2 in. of insulating block has the same heat flow through the walls as one built of 4½ in. of No. 80 insulating firebrick and 2 in. of insulating block that there is a weight ratio alone of 1 to 16, or in other words, the furnace lined with No. 80 insulating firebrick has only 6¼ per cent. of the heat-storage capacity of the firebrick lined furnace.

The brick may be used without a facing of firebrick on the furnace side, exposed to furnace temperatures and gases and protected only by a coating of No. 80 high temperature or patching cements.

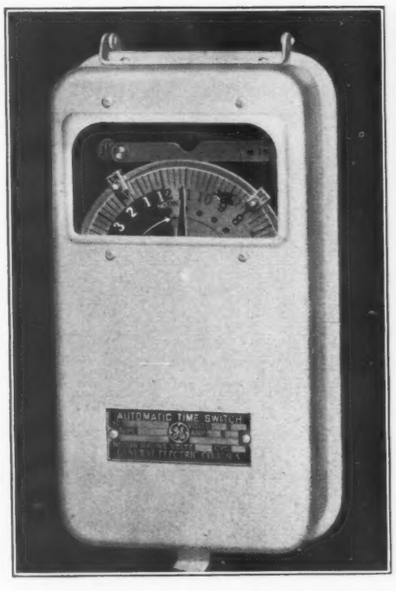
The brick is suitable for lining oil and gas fired furnaces, electric furnaces of the resistance type and for coal-fired equipment wherever it may be used in protected wall areas not exposed to mechanical abrasion and slag action. These bricks are extremely easy to handle and may be cut, drilled or shaped with ordinary woodworking tools.

Automatic Time Switch Corrected for Latitude

To duplicate the possibilities of a new type of time switch, a man would need an almanac, a knowledge of latitude and longitude, a precise watch, a degree of punctuality far above the average, and the ability to be awake and alert at all hours.

The switch, a product of the General Electric Co., will turn lights on and off at dusk and at dawn, or at any predetermined time before or after sunrise and sunset; and will make due allowances for geographical latitude and for the season of the year. It can be made to take holidays, omitting its operations on any desired days of the week. It can perform such operations as starting motors in the morning, starting and stopping them throughout the day according to schedule and shutting them down at the end of the day. It will care for industrial heating problems, since by its use apparatus may be turned on early in the morning so as to be ready for the workmen when they arrive.

Three features of the new time switch, designated as GE Type T-13, are the use of the G. E. Telechron motor, as used in electric clocks, for timing the device; the employment of mercury-to-mercury Kon-nec-tor switches; and the availability of astronomic dials, corrected for latitude. It is designed for alternating-current circuits of 115 volts and 30 amperes, or 230 volts and 15 amperes current-carrying capacity. It is available in single- or double-pole, both single- or



The automatic time switch.

double-throw, and with either a plain or an astronomic dial.

Two adjustable riders ("on" and "off") give two operations every 24 hours. Except in the cases of the astronomic and two-circuit types, additional riders may be installed to give practically any number of operations daily; and the addition of an omitting device permits one or more days to be skipped if desired.

The housing is such that the time switch can be used for either indoor or outdoor service. The case measures 10 5/16 in. in height, 5 3/8 in. in width, and 5 in. in depth. The instrument weighs 6½ lb.

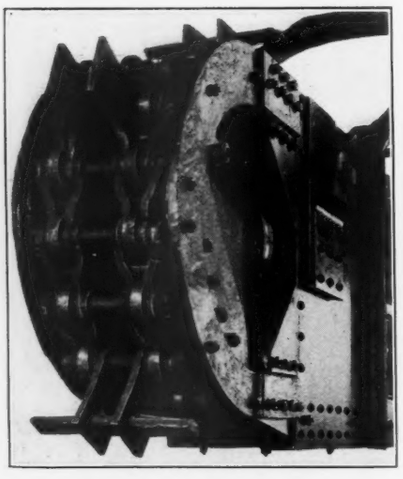
Improvements Announced on Dredge-Ladder Chain

The Eagle Iron Works, DesMoines, Ia., has just placed on the market two new improvements having to do with their Swintek suction screen-nozzle ladder, used in sand-and-gravel dredging operations.

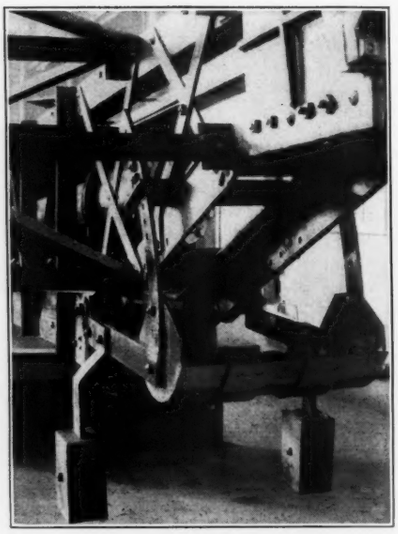
A new chain tightener has recently been added to the Eagle ladder as standard equipment. The tightener is a cradle which rides the chain just below point of chain connection to drive sprocket at end of barge. Slack in the chain is taken up at this point, eliminating all possibility of slack at the digging end of ladder where there is danger of picking up oversized rock between chain and ladder frame or sprocket to cause damage or other troubles. It is in principle equivalent to any belt-tightening device.

New three-piece hook links are now being furnished with Swintek ladder chain in place of the varying hook-link patterns formerly used. These new hook links provide greater strength, greater flexibility and fewer patterns, and can be used with outboard cutter bars as required.

All hook links are of the same straight patterns. For ladder clearance cutting, as many of the cross bars can be used as are necessary. These bars are held in place by small



New 3-piece hook links.



Rear view of the chain tightener.

lugs but are not rigid, thus giving a flexibility in the chain to absorb some of the shocks in cutting without transmitting them directly to the drive unit. Any strain on the cross bars is lessened by the fact that the edge of the straight hook link enters the deposit and breaks the way for the bar which then in effect cleans the cut. The cross bars are ribbed lengthwise for greater strength.

Adds Two New Sizes of Gravel-Washing Machines

The Eagle Iron Works, DesMoines, Ia., announces the addition of two new standard sizes in its line of sand-and-gravel washers, slightly larger than any yet made as standard. Many operators have required these larger sizes and it was therefore decided to add the new washers to the line as standard equipment.

These machines are made with 22-in. and 24-in. diameter screws, with proportionate overall increase in size of parts to give greater capacity.

The company is also building special washing equipment where conditions do not permit the use of standard units.

Center-Pivoted Rollers Make Conveyor Run True

The Robins Beltrainer is a device for making a flat belt run true. One Beltrainer substituted for every fifth return idler will keep a belt running true within ½ in. of the conveyor center line, according to The Robins Conveying Belt Co. who recently introduced the device.

The Beltrainer is simple in construction, is non-adjustable, and is entirely automatic in performing its function. Unlike guide idlers, it acts upon the flat surface of the belt and, having no contact with the edges of the belt, saves the belt from any edge wear. It is said to function perfectly whether its surface is clean or covered with sticky material, and no material stuck to the surface of the belt itself will affect its operation.

The Beltrainer consists of a tubular roller mounted upon a single anti-friction bearing at its center, which in turn is internally pivoted upon a fixed king pin located exactly on the center line of the conveyor. The roller is therefore not only free to rotate on the bearing, but also to rock about this pivot. The device acts something like a scale balance in operation for when the weight of the belt happens to fall more on one side of the pivot than the other, the roller rocks downward on the heavy side. The training effect is due to the fact that the king pin is inclined at an angle of about 45 degs., so that as the roller rocks downward on one side, that same side moves forward at the same time and the opposite end moves back. This skewing action steers the belt back to the central position where it belongs.

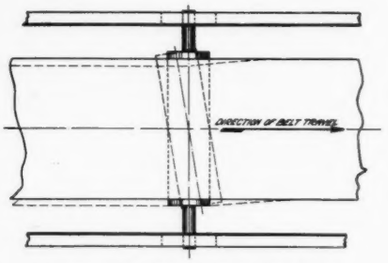


Diagram showing action of belt idler.

The Beltrainer does not oscillate continually as might be expected, but automatically assumes a stable position. The belt also, instead of veering from side to side, finds its central position and runs true without the slightest deviation.

Sheffield, Ala. Plants Land Important Awards

C. A. Perry, general manager of the Rockwood Stone Co. of Sheffield, Ala. states that his company has received an order for 500 carloads of limestone for construction of railroad station at Philadelphia. The order, the largest ever received by the company, calls for 250,000 cu. ft. of stone and will keep 250 men working day and night for about eight months.

Under a recent contract 1,000 carloads of sand and gravel will be furnished by the Tennessee Valley Sand & Gravel Co., also of Sheffield, for construction of the Missionary Ridge road at Chattanooga, Col. L. E. Wilson, president of the company, states. Three months will be required to complete delivery of the sand and gravel at Chattanooga, Col. Wilson says. A dredge, towboat, quarterboat and fleet of barges, together with about fifty workmen, will be engaged on the Tennessee contract.

Insurance Problems Discussed

Employees' Automobiles

"IT'S not my car, and I don't drive it," said an employer in talking about a salesman who used his own automobile on company business. Nevertheless the firm had an interest in the insurance on that car.

The use of automobiles for business purposes, aside from company-owned cars, involves every conceivable variety of relationship between employer and employee. Salesmen, foremen, collectors and inspectors all use their own cars on company affairs. The expense of compensating men for such use is met in various ways. Some firms pay the exact expenses as shown by vouchers. Some give a monthly allowance based on average use. A few firms make no separate item for this and figure that the upkeep of the car is taken into account in fixing the man's salary. The most common and most generally satisfactory arrangement is to allow the employee a fixed rate of several cents per mile. This rate should include not only the cost of fuel but an estimated sum for depreciation and insurance. With such an arrangement the firm can make definite demands on the way the car is to be used.

Public Good Will

Of all aspects to the use of employees' cars most vital is that of liability insurance. Obviously it is good business for the firm to have its men protected by sound insurance, regardless of whether the firm itself is implicated in any accident. If one of your men is responsible for an accident and is unable to make good the damage, his failure is not a good thing for the reputation of your firm. Also, if he has no insurance and has to put in time and worry on chasing witnesses and settling up, this will react on his work. For these reasons many manufacturing concerns absolutely insist that all employees who use their cars during working hours shall carry insurance in companies approved by the management, and usually assist the men by contributing from one-fourth to one-half of the premium.

Is Firm Liable?

Some employers feel that they do not have a tight enough personal hold on their men to dictate such an expense as insurance, and these are brought face to face with two questions: (1) Is the firm legally liable for what the employee does with his car, and (2) can the firm insure its own risk without regard to the employee?

No cut-and-dried answer can be given to the first question. Automobile claims come under the old common law, which merely says that anyone who injures the person or property of others shall pay indemnity for the damage. It is therefore not a question of law but one of facts. In each specific case—who was responsible for the accident? Of course the driver of the car (the employee) must inevitably bear part of the blame, but sometimes two parties may be jointly liable—one for doing the driving, the other for giving orders. The employer is liable for damages if he exercises any control over the operation of the car. Evidence of such control may include the following items:

(a) Firm name painted on car;
(b) Route laid out by officer of firm;
(c) Driver told to go in certain way or speed;
(d) Employer riding in car;
(e) Car used to carry goods or samples;
(f) Whether driver is a full employee or part-time worker with other jobs;
(g) Whether accident occurred during business hours and in direct line of calls.

Common Law Governs

The simple fact that an accident occurred during business hours does not technically make the employer liable. But you can count on the fact that the injured party's attorney will always try to implicate the employer because he presumes the employer has more money with which to pay damages. How far juries will go in "soaking" a business firm we learned from personal experience recently when one of our clients paid $2,000 damages in the case of an employee who was deliberately violating his superior's orders and was over a mile away from the route he was instructed to follow. Jurors' natural feelings of sympathy for the "little fellow" and coldness toward business concerns means that the employer is pretty certain to be sued in case of any accident and the burden of proof is put on him to establish that he had no control over the car.

Non-Ownership Insurance

Granted, then, that you may be responsible for the way your men drive their cars and that you may not be able to compel them to pay for full coverage, what can you do to protect yourself? You have no interest in fire, theft and collision losses, for these affect only the employee's own property. What you want is "public liability" and "property damage"—insurance covering your legal liability in case one of your men damages the person or property of others. This is covered by a policy form known as "non-ownership liability" insurance, which is issued by all of the large standard insurance companies. For the purposes of this policy your employees are divided into two classes, (1) the first being all who regularly use their cars in business (such as salesmen and superintendents, whether paid by salary or commission), and (2) the second being all others (such as men who use their cars only to come to work or who take them occasionally for emergencies or special jobs). The second class is mainly important to large firms where the principal executives cannot hold the reins tight enough all down the line to prevent someone from "hopping into his own car just to save time" and saddling a big liability claim on the company. The rate for the second class is only a few cents per employee.

Policy Form

The first class is vitally important, just as much so to the little firm with three outside men as to the industrial giants. In buying non-ownership liability insurance the employer submits a list of all men who usually use their cars in business, and a list of changes (if any) is furnished once a month. In return the insurance company assumes the full liability on behalf of the employer to defend all claims, whether valid or not, and pay damages. The cost of this protection is only about one-third the rate for full automobile liability insurance.

The same principle can be followed in covering trucks, if your trucking is done by an independent contractor or teaming company.

Williams Named Head of Chain Company's Office

E. O. Williams, associated for the past sixteen years with the transmission and industrial chain trade in various sales capacities, and formerly manager of the Howe Chain Co., has been placed in charge of the Philadelphia office of The Union Chain & Mfg. Co., Bourse Bldg., Philadelphia.

The parent company manufactures a complete line of silent and roller chain, slow-speed transmission, elevating and conveying chains at its Sandusky, O., plants, and Mr. Williams' selection was made because of his practical knowledge of these various products and his close understanding of the chain requirements of users in the territory.

Cement Quarry Supplies Stone for Road Building

The Louisville Cement Co. quarry at Milltown, Ind., is working two 8-hour shifts to supply stone for road construction in Indiana and Illinois. Approximately 100 men are employed. It is said that a third shift may be added if the demand for stone increases.

Should the Big Aggregates Associations Merge?

HERE are the last words of several exhibitors in answer to an editorial in PIT AND QUARRY which suggested the possible benefits that might accrue from a merger of the National Sand & Gravel Assn. and The National Crushed Stone Assn.

Favors Merger or Basis of Lower Exhibit Costs

To the Editor:

In connection with the merging of the shows of the National Crushed Stone Association and the National Sand and Gravel Association, while we do not have experience enabling us to make a judgment, it would seem from a selfish viewpoint that it would be a good thing, because it would cut our expense of participation exactly in two. However, this may not be the sole consideration, and no doubt the leading spirits in the two associations will find the right solution.

TRAYLOR ENGINEERING & MFG. CO.
G. B. Livingood, *Adv. Mgr.*
Allentown, Pa.

Merger Desirable, Says Westinghouse Official

To the Editor:

I have read with interest your editorial relative to merging associations whose interests are parallel. There is no doubt that, if the objections of the various people holding offices in associations whose work is duplicated could be overruled, mergers could be effected that would be beneficial to manufacturing concerns such as ours. For instance, we would like to participate in the sand-and-gravel, crushed-stone and road-builder exhibitions, but, because of the necessity of keeping within a strict budget figure, this has been impossible in the past. If the expositions of these three associations could be combined with the convention held at the same time, then we could reach, with one display, the three industries which are really allied. We believe that your paper could do considerable towards accomplishing this desirable merger, and I know that many concerns would greet a combination of this character as a real economy.

WESTINGHOUSE ELECTRIC & MFG. CO.
P. H. Grunnagle, *Exhibition Section.*
East Pittsburgh, Pa.

Calls Plan Intelligent and Practical Proposal

To the Editor:

We are in thorough agreement with your ideas as outlined in the editorial, "Should the Big Associations Merge?" which appeared in a recent issue of PIT AND QUARRY. We have long felt that a combination of the conventions and machinery exhibits of the two associations would be of untold benefit both to the crushed-stone and sand-and-gravel producers and to the manufacturers who serve these industries.

The matter of reducing the cost of exhibiting at the two separate conventions of the crushed-stone and sand-and-gravel associations has been receiving considerable attention from our company of late. We have definitely made up our minds that the expense, under present conditions, is excessive. In coming to this decision, we have considered not only the financial expense connected with the exhibit of our material at the two conventions, but also the loss of valuable time of our salesmen and representatives by taking them away from their offices and territories for a period of two weeks at a time when sales effort in the field should be most productive.

We see no good reason why the two associations should not be brought together in one unit, at least so far as combining their annual meetings and machinery exhibits is concerned. Attendance at the convention under these conditions is bound to be greatly increased and interest in the manufacturers' exhibits materially stimulated. At the same time, the cost of holding the convention and the cost to the manufacturer of exhibiting can be just about halved, while a week of valuable time can be saved to both the manufacturer and the producer.

Beyond question, the combining of the two conventions is a step in the right direction and one which should receive the support of every interested manufacturer. Please be assured that we are whole-heartedly with you in your attempt to crystallize sentiment in favor of such a union and that you have our good wishes for success in accomplishing what we consider an intelligent and practical move.

MANGANESE STEEL FORGE CO.
Chicago, Ill. *W. H. Potter, Mgr.*

Suggest Two Divisions of Single Association

To the Editor:

From the standpoint of the manufacturer and exhibitor we are, of course, interested in seeing that a merger such as you suggest in "Should the Big Associations Merge?", is made. The form this merger should take is, of course, entirely up to the associations involved. However, we would suggest that the simple method be the merging of the two associations under one set of officers, following which, if the two industries desire to retain their individuality, they could be classed under two divisions—namely, sand and gravel and crushed stone. On the other hand, this work could be as readily taken care of by general committees, who would handle matters of common importance to the two industries, with special committees covering these subjects where the conditions involved are dissimilar.

DEISTER MACHINE CO.
B. J. Roberts, *Sales Mgr.*
Fort Wayne, Ind.

Wire Cloth in 400-Mesh Size Finest Ever Made

A world's record has been established by the Newark Wire Cloth Co., Newark, N. J., by making a 400 mesh wire cloth. It is said to be the finest wire cloth ever made. Heretofore the finest wire cloth ever made in the United States has been 325 mesh and it, too, is made by the Newark Wire Cloth Co. It is known as Sieve Number 325 by the U. S. Bureau of Standards, and has been adopted as standard by the American Society for Testing Materials.

Some ten years ago the Bureau of Standards in its investigation of testing screens, said that it seemed impossible for American manufacturers successfully to manufacture wire cloth with meshes finer than 100 to the inch, and that wire cloth with finer meshes had to be imported. For a long time previous to this all of the fine wire cloth on sale in the United States came from foreign countries. At that time 325 mesh was the finest made, and 250 mesh was the finest produced in the United States.

It is a fact that the manufacturers of the United States had been rather backward in the fabricating of wire cloths finer than 100 meshes to the inch until about 1912, when some experimental work was started in weaving a piece of 200-mesh cloth of a special metal for a large laboratory. After overcoming many difficulties a piece of 200-mesh cloth 34 in. by 100 ft. was completed, using special metal of a diameter of 0.0021 in. From that time on Europe has had American competition.

Selects Representative for Waco, Tex. District

The Texas Contractors Supply Co. of Waco, Tex., will represent the Gardner-Denver Co. on all rock-drill products and portable compressors. Both of the above companies are very well known in contracting, engineering and oil-field circles.

Why you must buy lubrication - not oil

THERE is much more to correct lubrication than quality in oil. It is not enough to know that an oil or grease has high lubricating qualities. The best lubricant in the world, incorrectly used, can cause trouble to your equipment and increase your lubrication costs.

Modern mining machinery, more complicated in design, requires more certain means of lubrication. Correct lubrication of such equipment calls for a study of individual operating conditions—of each machine—of each unit of equipment.

This is the service that the Standard Oil Company (Indiana) offers you. Our lubrication engineers are trained men. They have studied the lubrication needs of every type of mining equipment. They have been able to effect lubrication improvements in many mines—improvements that have reached far beyond savings in lubrication costs. To assist them in their work they have at their command a complete line of the highest quality industrial lubricants and the co-operation of our great research laboratories.

This service may lead to economies for you. Talk it over with one of our engineers any time at your convenience.

STANDARD OIL COMPANY (*Indiana*)

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